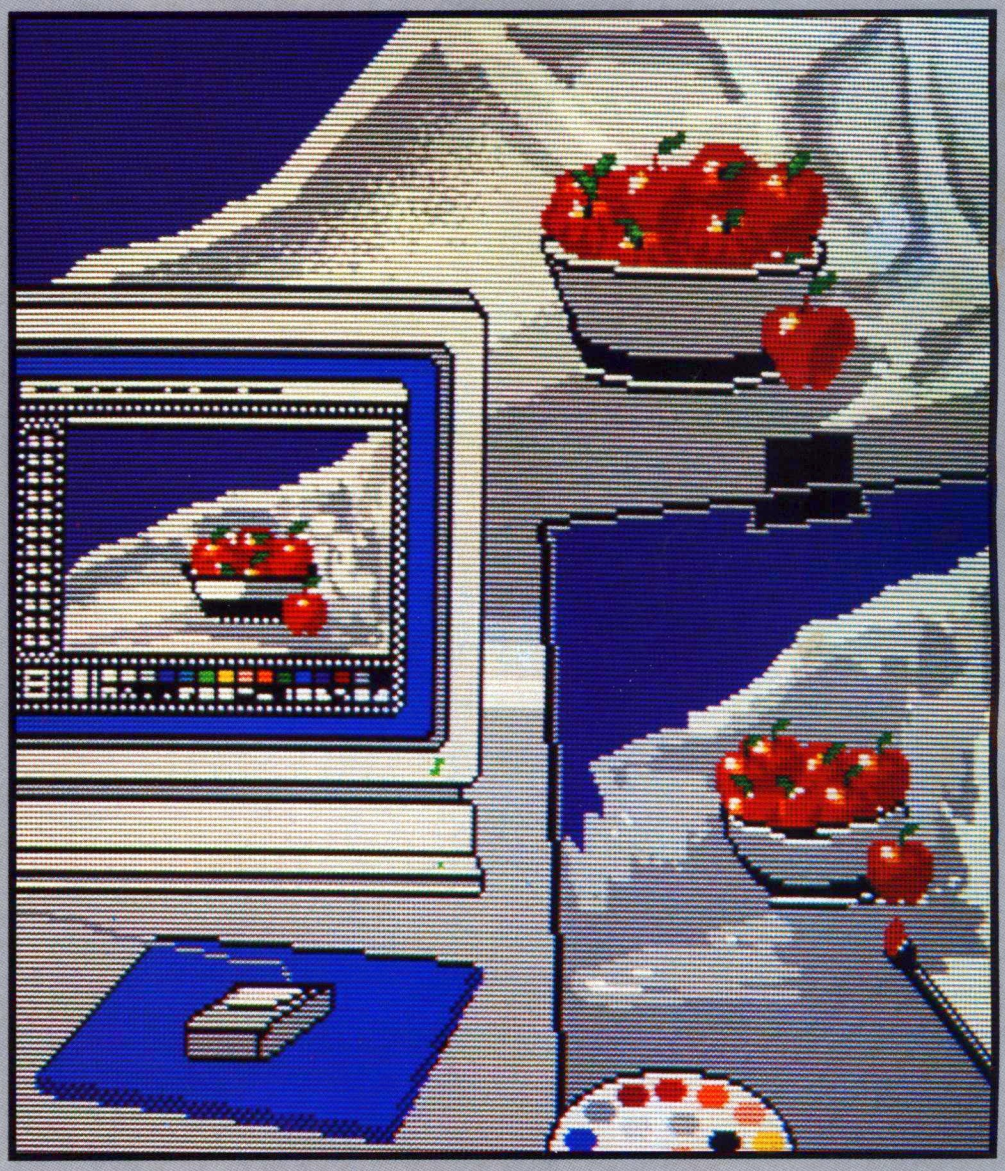
Call-A.P.P.L.E.™

World's Largest Apple User Group Magazine

April 1987 • $3.00 U.S.

Apple II Graphics

- Apple IIGS Graphics Hardware
- Visualizer: Business Graphics Review
- Lo-Res Kaleidoscopes
- Anatomy of the IIGS System Disk
- TML Pascal Conference
- Memory Expansion in the Apple II
- Modular Assembly Language Part 4
- Silicon Intelligence



- Apple Doctor • AppleWorld '87 • Write A.P.P.L.E.
- New Products • And More...

0 74470 19152 0

Apple PugetSound Program Library Exchange

Preferred Computing

ORDER TOLL FREE
1-800-327-7234

Computer Accessories — When Only the Best Will Do!

VISA COD MasterCard

We only sell proven products that work. By selling only the industry best, we can assure you of the highest level of reliability and performance. Selling large volumes of a smaller product line allows us to have the lowest discount prices and fast same day shipment.

AE APPLIED ENGINEERING™

RamWorks III™ If you have a IIe this card is perfect and if you use AppleWorks, it's an absolute must! Applied Engineering was the first company to expand AppleWorks and they're always 6-12 months ahead of the competition. And you can stay current with our FREE SOFTWARE UPGRADES. Why settle for a partial compatible when you can have a real RamWorks at a discount price.

RamWorks III 256K **$169**
RamWorks III 512K **$209**
RamWorks III 1 MEG **$269**
RamWorks III 1.5 MEG **$389**

65C816 16 Bit Card Requires RamWorks II or III and Apple IIe. **$149**

RamWorks RGB Option Even if you bought a RamWorks just to use the RGB option, it would be worth it. Runs both Apple and IBM RGB monitors, and is compatible with Apple's standard for RGB, includes cables. **$99**
(See our new RGB monitor ar right.)

TransWarp™ We tested all the accelerators and TransWarp was 20-300% faster than the others. Runs cool too! **$219**

Z-80 Plus™ Runs all CP/M® software. Includes operating system and manual, a great value. **$109**

Timemaster H.O.™ Timemaster H.O. has the most features and is the easiest to use. It comes with more software than any other clock card. It even adds 15 new commands to BASIC! **$79**

Phasor Simply the best sound and speech synthesizer for the II+, IIe, or IIGS. **$139**

SerialPro A powerful multifunction card with serial ports and clock/calendar **$129**

Viewmaster 80™ Super resolution, total software compatibility and everything you need to run AppleWorks on a II+ or Franklin. **$109**

RamFactor™ If you have a II+ or would rather use slots 1-7 in your IIe or IIGS, RamFactor is for you. It is fully compatible with Apple's memory card, runs AppleWorks on a IIe, II+ or IIGS and has a battery back-up option.

RamFactor 256K..... **$189**
RamFactor 512K..... **$224**
RamFactor 1 MEG **$299**
Battery Back-up..... **$149**

Extended 80 Column Card with 64K Comes with full documentation. **$69**

GSRAM & GSRAM Plus These cards offer much greater performance and expansion capabilities than Apple's memory card and unlike most others, GSRAM and GSRAM Plus use standard RAM's so further expansion is easy and economical. Only GSRAM and GSRAM Plus can expand AppleWorks 2.0 internal limits and include a built-in printer buffer.

GSRAM 256K **$139**
GSRAM 512K **$179**
GSRAM 1 MEG **$249**
GSRAM 1.5 MEG **$319**
GSRAM Plus 1 MEG **$529**

IIc System Clock™ **$49**

Z-RAM Ultra — For all IIc's

Ultra 1: Memory Only	256K	**$169**
	512K	**$209**
Ultra 2: Memory & Clock	256K	**$209**
	512K	**$249**
	1 MEG	**$319**
Ultra 3: Memory, Clock & CP/M	256K	**$259**
	512K	**$299**
	1 MEG	**$369**

More Quality Products

Ultra Hi-Res RGB Monitor/TV This Sony RGB monitor uses a 13" ultra hi-res CRT for super sharp 80 column text and great graphics. But in addition to being the best RGB monitor available this unit is also a 180 channel cable-ready television set with remote control. Try it. You WILL like it. (List $625) Only **$499**

RGB Cable For above **$29.00**

5-1/4" Disk Drive Super quiet direct drive compatible with all Apple software and Apple controller card. A top quality unit with 1 year warranty. Only **$119**

5-1/4" Disk Controller Runs up to 2 drives. **$49**

16K RAM Card For Apple II and II+ **$69**

Heavy Duty Apple Power Supply With over twice the output current of Apple's original power supply. **$59**

Kensington System Saver Fan with 2 power outlets and surge protector. **$69**

Internal 1200 Baud Modem Cermetek 1200, for Apple IIe, II+ and IIGS runs at 1200 and 300 baud. Auto-dial, auto-answer with built-in speaker. Hayes compatible, with built-in communications software. Comes complete with cable and manual. (List $299) **$149**

Pinpoint's AppleWorks Accessories The best available and they are written to fully utilize Applied Engineering's RAM cards. (Includes RAM enhancement software). Together a $118 value. Only **$69**

MacroWorks and Super MacroWorks ". . . the best single AppleWorks add-on available today." A+ Magazine. Add new word processing power, create your own Macros and save lots of keystrokes. Use mouse with AppleWorks. No more pathnames! Just select from a menu. Works with Applied Engineering cards and software. Buy MacroWorks for AppleWorks versions 1.0 - 1.3. Buy Super MacroWorks for AppleWorks version 2.0.

MacroWorks (List 34.95) **$29.00**
Super MacroWorks (List 49.95)... **$39.00**

256K RAMS 150ns. 5 year warranty. Set of 8 **$39**

VIP Professional Lotus 1-2-3 Workalike. For IIe & IIc (List $249) **$169**
For IIGS (List $299) **$199**

RamWorks™ That's right, RamWorks not RamWorks II. RamWorks is the memory card that started the revolution. RamWorks can expand to 512K on the main board and up to 1 meg with an optional 512K piggyback and can accept Applied Engineering's new RGB option. A 512K RamWorks gives AppleWorks a 360K desktop. Comes with Applied Engineering's newest software. With 512K **$139**

Why buy from us?

1. Toll free 800 numbers for orders.
2. We almost always ship from OUR stock. Call us before 3 P.M. and it ships today.
3. All memory cards have factory installed and tested RAM chips.
4. We're nice guys that want to help. We want our business to grow because of repeat customers and word of mouth.
5. We handle only the industry's best. We've tested and used all the products we sell.
6. 15 day money back satisfaction guarantee on hardware. If you don't like something, we'll give you your money back. No hassles.
7. We'll support, service and warranty everything we sell.
8. No surcharge is added for charge cards and we won't charge your card until we ship.
9. No sales tax is collected on orders outside Texas.
10. All shipments are insured by us.

Order by mail: Send check or money order to Preferred Computing, P.O. Box 815828, Dallas, TX 75381
Order by phone: 1-800-327-7234 Visa, MasterCard or COD
Texas, Hawaii and Alaska 1-214-484-5464

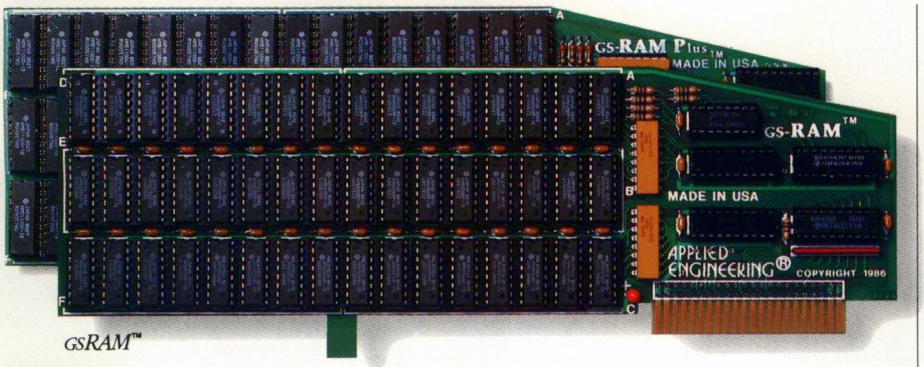
Orders only call 1-800-327-7234
Questions and Customer Service call 1-214-484-5464
Texas residents add 6¼% sales tax

Prices subject to change without notice

Insist on GSRAM™ When You Buy Your IIGS™

Expand the IIGS RAM and ROM with the GSRAM or GSRAM Plus with ROM Pak. Available now with 256K to 8 MEG!

GSRAM Plus™



GSRAM™

Remember the 16K cards for the II+ and the 64K cards for the IIe? At the time, that much memory seemed like a lot. But when the owners of these memory cards came to us for more memory, many had to throw away their smaller Apple memory cards or try to sell them. Most of our customers told us that had they known about Applied Engineering's larger memory cards when they bought their Apple, they would have purchased them at the same time.

GSRAM and GSRAM Plus are available now, allowing up to 8 MEG of memory expansion. That's 8 times the memory capacity of Apple's card and just look at the benefits that only GSRAM and GSRAM Plus have over Apple's card:

- Lower cost
- Has 6 RAM banks (Apple's card has 4)
- Has memory expansion port
- Has ROM expansion port
- No configuration blocks to set
- No soldered in RAM chips
- Expandable to 8 MEG
- Expands AppleWorks internal limits
- Built-in Hi-Res self-diagnostic software
- 5 year hassle free warranty (Apple has a 90 day warranty)
- Made in USA

GSRAM for More AppleWorks Power

Only GSRAM and GSRAM Plus eliminate AppleWorks internal memory limits, increasing the maximum number of records available from 6,000 to over 25,000 and only GS-RAM and GSRAM Plus increase the number of lines permitted in the word processing mode from 6,000 to over 15,000. And only GSRAM and GSRAM Plus offer a built-in printer buffer so you can continue using Appleworks while your printer is printing. GS-RAM and GSRAM Plus even expand the number of lines in the clipboard from 255 to 2047 and will auto segment large files so they can be saved on two or more disks. You can even have Pinpoint or Macroworks and your favorite spelling checker in RAM for instant response. GSRAM and GSRAM Plus will even display the time and date right on the AppleWorks screen. Nothing comes close to enhancing AppleWorks so much.

Turn Your IIGS into a Giant

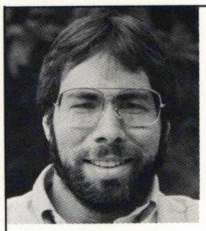
Simply plug GSRAM into the IIGS memory expansion slot and you've got up to *8 megabytes* of RAM at your fingertips—all of it instantly and automatically recognized by the IIGS. GSRAM is compatible with all IIGS software, including AppleWorks, as well as BASIC®, ProDos, DOS 3.3, PASCAL®, "C" and CP/M®.

Grow by Bytes or Megabytes

We offer GSRAM in two configurations so you can increase your memory 256K at a time (GSRAM) or a megabyte at a time (GS-RAM Plus). Both offer full compatibility, lower cost than other boards, and easy expandability. And both are extremely low in power consumption. A fully expanded GSRAM operates at only 375 ma, and GSRAM Plus at only 270 ma (even with 6 megabytes on board!)

GSRAM—for Normal Memory Requirements

GSRAM is available with 256K, 512K, 1 MEG or 1.5 MEG of memory already on board. If you don't need the full 1.5 MEG now, you can choose a GSRAM with less memory and expand it up to 1.5 MEG in the future—or upgrade to GSRAM Plus for a small charge.



"In quality, performance, compatibility, expandability and support, Applied Engineering's GSRAM and GSRAM Plus are number one."

Steve Wozniak, the creator of Apple Computer

With an optional piggyback card, you can expand GSRAM even higher than 1.5 MEG! (Other cards are only expandable to 1 MEG.)

GSRAM Plus—for Growing by Leaps and Bounds

GSRAM Plus is the first Apple memory card to use 1 MEG RAM chips on the main board. It's available with 1 to 6 MEG on board. If you don't need the whole 6 MEG now, you can buy a GSRAM Plus with less memory and easily expand it in the future.

GSRAM Plus can be expanded up to 8 MEG with an optional piggyback card.

Easy Expansion

Both GSRAM and GSRAM Plus use standard RAM chips that are readily available and just plug right in. So unlike other cards, you'll find expanding your GSRAM or GSRAM Plus easy, convenient and very economical. And with our optional ROM expansion module you can even increase the IIGS's ROM space and all in just one slot.

Quality and Support of the Industry Leader

Applied Engineering is the largest supplier of Apple peripherals in the world. We *invented* the first large RAM cards for the Apple. With a 5-year "no-hassle" warranty and outstanding technical support, you can be sure GSRAM and GSRAM Plus will deliver the performance you're looking for—or return them within 15 days for a full refund.

GSRAM with 256K	$169
GSRAM with 512K	$219
GSRAM with 1 MEG	$299
GSRAM with 1.5 MEG	$379
GSRAM with 2-8 MEG	CALL
GSRAM PLUS with 1 MEG	$459
GSRAM PLUS with 2 MEG	$759
GSRAM PLUS with 3-8 MEG	CALL

Order today!

See your dealer or call Applied Engineering today, 9 a.m. to 11 p.m. 7 days. Or send check or money order to Applied Engineering. MasterCard, VISA and C.O.D. welcome. Texas residents add 6¼% sales tax. Add $10.00 outside U.S.A.

APPLIED ENGINEERING™

The Apple enhancement experts.

(214) 241-6060

P.O. Box 798, Carrollton, TX 75006

CP/M is a registered trademark of Digital Research, Inc.

CIRCLE 2 ON READER SERVICE CARD

Call-A.P.P.L.E.™

Volume 10, Number 4 April 1987

Official Publication of **A.P.P.L.E. Co-op** "People Helping People with Personal Technology".

Features

Apple IIgs Graphics Hardware•Laurence A. Thompson 10
An "inside" look at Apple II / IIgs graphics hardware by a member of the GS design team.

Visualizer: Business Graphics for the GS•Jeffrey M. Jacques 14
A new IIgs product for producing graphs from AppleWorks and/or Visualizer data sheets.

Lo-Res Kaleidoscopes•Lucia Grossberger & Bob Bishop 18
Using an established module "COLORMAP" to create animated kaleidoscopes.

Anatomy of the IIgs System Disk•Ken Kashmarek 24
A description of the contents, layout, and organization of the ProDOS 16 system disk.

TML Pascal Conference•A dialog taken off of GEnie 32
A question and answer session on TML Pascal, including input from the author.

Memory Expansion in the Apple II•Peter & Allen Baum 36
A discussion of the importance of memory expansion and the existing standards.

Modular Assembly Pt. 4: A Little Hi-Res Movie•Bob Bishop 40
A new subroutine RWBLOCK accesses 64K auxiliary memory of the IIe/c.

Silicon Intelligence•Michael & Lisa Storrie-Lombardi 46
Some of the special features which make Object Logo stand out in the crowd.

AppleWorld '87•Kathryn Hallgrimson Suther 51
The Apple II Forever?

Letters

A.P.P.L.E. Doctor•Bruce F. Field/Robert C. Platt 49
Some useful tips and practical advice.

Write -A.P.P.L.E 52
Readers' Forum

Departments

A.P.P.L.E. Co-op New Products and Specials 5

the inside track•Kathryn Hallgrimson Suther 8

Member Services 9

A.P.P.L.E. Consultants 9

The Marketplace 53

Unclassifieds 58

Advertiser Index 55

About the Cover

The paintbrush, the easel... the mousepad and the mouse. Quite a change in medium. Cover design by Mary Hubert. Screen photographed by Larry Neibauer.

Call -A.P.P.L.E. (ISSN 8755-4909) is published monthly by Apple PugetSound Program Library Exchange, 290 S.W. 43rd Street, Renton, Washington 98055. (206) 251-5222. Basic subscription price is $21 per year. Membership in A.P.P.L.E. Co-op, which includes magazine subscription, is $26 per year plus a one-time $23 application fee. Additional postage is required for First Class or foreign delivery.
Second-class postage paid at Renton, Washington, and at additional mailing offices. POSTMASTER: Send address changes to *Call -A.P.P.L.E.*, Address Change, 290 S.W. 43rd St., Renton, WA 98055.

A.P.P.L.E. Co-op

New Products & Specials

Prices good through May 15, 1987

AUTOWORKS

from The Software Touch

AutoWorks is the Appleworks enhancement program that adds to your AppleWorks the following features:

Mail Merge: Use Mail Merge to print out form letters, print out reports or fill out forms from an AppleWorks database file. Form letters are automatically reformatted for each letter and since AutoWorks is built-in, you don't need to exit AppleWorks to do a mail merge.

Macros: AutoWorks powerful macro capabilities allow you to enter hundreds of keystrokes into AppleWorks by pressing a single key. With macros, you can program AppleWorks to do anything you want it to do. You can even create your own AppleWorks commands.

Disk Organizing: AutoWorks reads your ProDOS disk directories into an AppleWorks database file so you can quickly locate a specific file and determine what disk it is on, print out sorted reports of the contents of your disks, locate disks with room to store more files, find the most recently updated files, etc. If you own a hard disk, this feature is great for obtaining information for every file on the entire disk.

Mouse Control: With AutoWorks you can use the mouse to make menu selections, quickly scroll through documents, and to position the cursor to make updates to your documents.

Price : $31.00 I Code : **S2SEAW** I Wt. : 10 OZ. I

PAINTWORKS PLUS™

from Activision, Inc.

PaintWorks Plus for the Apple IIGS not only allows you to create amazing pictures in full color but also will let you animate your creations as well. You can use up to 16 colors in a single picture, and you can choose those sixteen colors from a palette that contains 4096 colors in all. You can also create a series of pictures that show an image changing or moving, and PaintWorks Plus will animate the series for you automatically. With PaintWorks Plus you can:

- Choose from a total of fifteen different tools to paint with.
- Enlarge a section of the picture to work on the details in "Fat Bits" mode.
- Create your own color palettes and save them for future use.
- Create new patterns at any time.
- Mix colors and patterns at will.
- Add text to your pictures in a variety of fonts, styles and sizes.
- Re-orient pictures or a section of your picture by rotating them or flipping them.
- Cut and Paste images from one part of the picture to another or from one picture to another.

Price : $59.00 I Code : **SGABPW** I Wt. : 1 LB. I

Call -A.P.P.L.E. FASTFIND

The guys on the HOTLINE say they still get calls asking for information from, or references to articles printed in *Call-A.P.P.L.E.* magazine. They say, "Ya, we published something about that - wait while I look it up in *FASTFIND*". Now, we don't want to put the boys out of business but just think, if you had *Call-A.P.P.L.E. FASTFIND*, you wouldn't have to waste money on all of those long distance calls. With *FASTFIND* finding the information you need is as easy as booting the disk and entering the text you wish to look for. Fast-Find will report each and every reference to the text by showing you the issue or publication, month and page number including cross-references if appropriate. Logical searches? No problem! How can you survive without it? Of course you could just call the guys on the HOTLINE...

Price : $15.00 I Code : **SFAST** I Wt. : 8 OZ. I

FASTFIND - *FASTFIND* program &**1985 Index with All About Applesoft Index**

Price : $10.00 I Code : **SFAST2** I Wt. : 8 OZ. I

FASTFIND - **1986 Index Only**

Price : $10.00 I Code : **SFAST3** I Wt. : 8 OZ. I

CUPERTINO COURTROOM

from Ivy League Yupware

Introducing the first in a new genre of User Abuser software soon to take the Mac community by storm. Based upon the romantic courtroom dramas of the 50's, Cupertino Courtroom makes you 'take the stand' to face the charge of "Intellectual Consumerism". Can you successfully defend yourself from Clive Hannibal, the ruthless prosecutor? It's doubtful. Who in their right mind would buy an IBM personal computer over an Apple? You!

You can charge Apple™ for unfair pricing, no direct consumer support, and short-lived warrantees. Call them a network of self-righteous bureaucrats. Declare that your purchase was a gesture of defiance (not that IBM is any better). Berate the practice of vaporware, and technically ignorant salesmen. Argue and threaten and kick and scream. This game is so advanced you can:

- Bribe the judge.
- Hire testimonial support.
- Plea bargain.
- Throw the weight of your company around.
- Throw yourself on the mercy of the court!

It will do you no good. But where else can you complain, except in the Cupertino Courtroom?

PRICE: $999.00 I CODE **APFOOL** I Wt. 10-20 years

ORDERING CHECKLIST

To speed all orders, please include:

1. Your Name as it appears in our records (same as on your mailing label).
2. Member number and expiration date.
3. Complete STREET ADDRESS (**not** Box number — see explanation below).
4. Phone number to reach you by day if we have questions.
5. Payment Including:
   Handling charge if applicable
   Domestic or Foreign Shipping Charges
   Magazine Postage if applicable
   (Sorry we do not accept COD or Purchase Orders on individual memberships.)

Each item you order needs:

6. Complete product name (and version if there is more than one product of that type). Specify computer model you are using.
7. Product Code

SHIPPING ADDRESS: We normally ship products by United Parcel Service (UPS). Therefore, the shipping address on your order cannot be a post office box. You may specify a P.O. Box for orders weighing less than 8 ounces. You also may make special arrangements for shipping some items via US Mail, Air Parcel Post, or UPS Second Day Air.

DOMESTIC SHIPPING CHARGES

SHIPPING WEIGHT	COST
Up to 5 Lbs.	$ 2.00
5-10 Lbs.	3.00
10-15 Lbs.	4.00
15-20 Lbs.	5.00
20-25 Lbs.	6.00
25-30 Lbs.	7.00
30-35 Lbs.	8.00
35-40 Lbs.	9.00
40-45 Lbs.	10.00
45-50 Lbs.	11.00

UPS 2ND DAY AIR

WEIGHT NOT TO EXCEED	48STATES A	HAWAII D
1 lb.	$ 3.00	$ 4.53
2 "	4.00	5.71
3 "	5.00	6.89
4 "	6.00	8.07
5 "	6.50	9.25
6 "	7.50	10.43
7 "	8.50	11.61
8 "	9.50	12.79
9 "	10.50	13.97
10 "	11.50	15.15
11 "	12.50	16.33
12 "	13.50	17.51
13 "	14.50	18.69
14 "	15.50	19.87
15 "	16.50	21.05
16 "	17.50	22.23
17 "	18.50	23.41
18 "	19.50	24.59
19 "	20.00	25.77
20 "	21.00	26.95
21 "	22.00	28.13
22 "	23.00	29.31
23 "	24.00	30.49
24 "	25.00	31.67
25 "	26.00	32.85

FOREIGN SHIPPING CHART

POSTAL TABLE	Zone I West Indies Central America, Columbia, Venezuela	Zone II All South American Countries (except in Table I), Europe, N. Africa	Zone III Asia, Mid East, S. Africa Australia and Pacific Islands	CANADA SHIPPING RATES
0-4 oz.	$ 1.51	$ 1.96	$ 2.41	0-4 oz. $ .76
4-8 oz.	2.13	3.95	3.95	4-8 oz. 1.48
8-12 oz.	2.75	4.12	5.49	8-12 oz. 2.20
12-16	3.37	5.20	7.03	12-16oz. 2.84
16-20 oz.	3.99	6.28	8.57	2 lb. 3.92
20-24 oz.	4.61	7.36	10.11	3 lb. 5.00
24-32 oz.	5.85	9.52	13.19	4 lb. 6.08
2-3 lbs.	8.29	13.84	19.39	
3-4 lbs.	10.73	18.16	25.59	*For weights over 4lbs: $6.08 + $1.08 additional per pound.*
Each additional ½ lb. over 4 pounds add:	1.22	2.16	3.10	

ORDERING

ORDER TOLL FREE
1-800-426-3667
(Outside Washington State)

Date _____

Name _____ **Membership #** _____ **Expires** _____

Address _____

City _____ **State/Country** _____

Zip _____ **Phone #** ( ) _____

Soc. Sec./Tax I.D. # (for dividend payments) _____

☐ **Check enclosed** ☐ **VISA** ☐ **MasterCard**

Account # _____ Exp. Date _____

	CODE	QTY.	PRODUCT	Shipping WT.	Unit Price	Amount
1.						
2.						
3.						
4.						
5.						
6.						

Total Shipping Wt. _____ **Sub Total** _____

*Non-Member add 10% _____

Washington Residents add 8.1% Sales Tax _____

TOTAL SHIPPING COST _____

$3.00 Handling Charge If Order Is Under $25.00 _____

TOTAL AMOUNT _____

Mail to: A.P.P.L.E. Co-op
290 S.W. 43rd St.
Renton, WA 98055
(206) 251-5222

More Power for APPLEWORKS™

MACROWORKS

by Randy Brandt
$34.95–Apple IIGS, IIc and 128K IIe
For AppleWorks version 1.3 or earlier.
(Version 2.0 requires Super MacroWorks.)

"...THE BEST SINGLE APPLEWORKS ADD-ON AVAILABLE TODAY."
–A+ Magazine, October 1986

"What is your FAVORITE Apple II software for 1986?"
1. AppleWorks
2. The Print Shop
3. MACROWORKS
–InCider Magazine's "Reader's Choice" Poll

MACROWORKS PUTS *YOU* IN CHARGE OF APPLEWORKS

After updating your AppleWorks disk once, you can put the MacroWorks disk away, then use AppleWorks like you always do. MacroWorks remains invisible until you need it. Most new features are accessed using the SOLID-APPLE (🍎) key (or IIGS OPTION key). All standard AppleWorks commands remain in effect.

Here are some of the new features that MacroWorks adds to AppleWorks:

APPLEWORKS MOUSE CONTROL
Optionally use your mouse for quick, precise control of menus, scrolling, highlighting, etc.

❑ **CREATE YOUR OWN MACROS**
Convert any series of AppleWorks keystrokes into a new single-keystroke AppleWorks command or "macro." Use our built-in macros or create your own.

For example, 🍎-N could type and center your name and address. Or 🍎-P could print (or save) *all* of your Desktop files, nonstop.

Or you could set up a macro that skips unwanted questions like *"How many copies?"* and *"Are you sure...?"*.

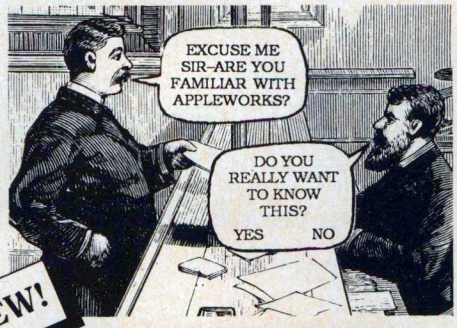
❑ **NEW SINGLE-KEYSTROKE WORD PROCESSOR COMMANDS**
- Character-delete and Word-delete
- Jump to the start or end of a line
- Erase an entire line
- "Undo" the last delete command
- Many more.

❑ **FOR THE WORD PROCESSOR, DATA BASE AND SPREADSHEET**
Create macros for all three applications. For example, in the Spreadsheet, you may find yourself typing the same series of keystrokes every day to sort a column of numbers. Set it up as a one-key macro!

❑ **PERSONALIZED HELP**
Rewrite AppleWorks' "Help" screens to display whatever information you want.

❑ **DESKTOP EXPANDER COMPATIBLE**
Works with the Applied Engineering™ and Checkmate™ Desktop Expanders.

❑ **NOT COPY PROTECTED**
You can install MacroWorks on a floppy disk, 3.5" disk, hard disk or RAM disk.



NEW!

SUPER MACROWORKS

by Randy Brandt
$49.95–Apple IIGS, IIc and 128K IIe
For new AppleWorks version 2.0.
(Version 1.3 & earlier requires MacroWorks.)

←MACROWORKS FEATURES PLUS...

Super MacroWorks provides the same AppleWorks enhancements and improvements as MacroWorks (left), **PLUS** the features below.

❑ **AUTO STARTUP**
Boot AppleWorks and it gets itself up and running without another keypress. You can also have any file automatically load, so you're ready to go to work!

❑ **DIRECTORY DATABASE**
Quickly read the file names from any or all of your ProDOS disks into the Data Base. Search and sort by file name, type, date, etc., and make printouts, to see what's *really* in that disk library of yours.

❑ **ON-THE-SPOT COMPILING**
Create and compile new custom macros "live" without leaving AppleWorks.

❑ **NO MORE TYPING PATHNAMES!**
When you want to access another disk or directory, you now select from a menu instead of typing a pathname. Simply highlight the directory name you want–it's just like loading files.

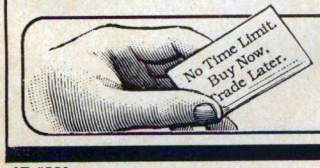
❑ **LINKED FILES**
Many possibilities–like the ability to define custom macros that work with a particular file. One keystroke can load a file, then load its associated macros.

❑ **READ-THE-SCREEN MACROS**
Lets you do many things, like convert characters, words or paragraphs from lower-case to UPPER-CASE and back.

And now you can cut and paste *anywhere*, including from field-to-field and record-to-record in the Data Base.

❑ **LOCAL/GLOBAL MACROS**
Define macros that work differently in different applications. For example, you could make 🍎-N do 3 different things:
- Word Processor ..... Type your name
- Spreadsheet ..... Type "3.14159"
- Data Base ..... Sort by Zip code

❑ **TIME & DATE MACROS**
One 🍎-keystroke automatically types the current date or time in any document.



Trade Up to SUPER MACROWORKS
MacroWorks owners with AppleWorks 2.0 may get a Super MacroWorks trade-in by mailing the front cover of their MacroWorks manual+$22.50 to Beagle Bros. (Calif. add $1.20 tax)

POWER PRINT

by Rob Renstrom
$39.95–any Apple II (64K minimum)

POWER PRINT LETS YOUR PRINTER DO WHAT IT WAS *DESIGNED* TO DO.

Power Print lets you "download" a second typestyle into your printer's memory so you can alternate printing with your printer's standard font and a new font with special characters and symbols.

OUR FONTS OR YOURS
Ten different fonts are included on the disk. An easy-to-use font editor lets you redraw any character in our fonts or design your own fonts from scratch.

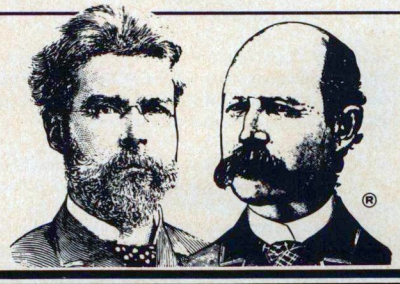
APPLEWORKS COMPATIBLE
In fact, Power Print is *everything* compatible. Just download a font (in less than 2 seconds), then boot AppleWorks, AppleWriter, ProDOS, DOS 3.3–or practically anything else–and custom printing is yours!

MIX GRAPHICS AND TEXT
Design up to 96 custom characters that combine to print a small illustration.

You may then include this drawing as part of your regular printouts.

←This logo was actually typed with AppleWorks and printed on an Apple ImageWriter. Other software and printers work equally well.

FULL-SPEED AHEAD!
Unlike other font software, Power Print *won't* slow your printer down one bit. Power Print works with most full-font downloadable printers, including:
APPLE DMP and **IMAGEWRITER** (I and II), **BROTHER** M1509, **CITIZEN** (20, 25), **EPSON** (EX, FX, JX), **OKIDATA** (92, 93, 192, 193), **PANASONIC** (1092, 1093), **STAR** (Delta, Radix, SG, SD, SR), and others



Beagle Bros MICRO SOFTWARE

3990 OLD TOWN AVENUE, SUITE 102C
SAN DIEGO, CALIFORNIA 92110

Available at most Software Stores

Or order by phone or mail. We ship next day (Mon-Fri). Add $2.50 shipping, $5.50 overseas. Visa/MCard/COD.

Orders and Information* 1-619-296-6400
Orders only, Toll Free* 1-800-345-1750
Orders only, California* 1-800-992-4022
*Mon-Fri, 9am-4pm Pacific
Order by MODEM (24 hours) 1-619-296-6490

CIRCLE 5 ON READER SERVICE CARD

A.P.P.L.E. Co-op

OFFICERS AND DIRECTORS

PRESIDENT: Dick Hubert
VICE PRESIDENT: Bob Huelsdonk
SECRETARY: Dave DeGroot
TREASURER: Bob Clardy
DIRECTORS: Dave Lingwood
Don Williams
Michael Storrie-Lombardi

ADMINISTRATION

EXECUTIVE DIRECTOR: Dick Hubert
GENERAL MANAGER: Don Steele
PRODUCT DEVELOPMENT/ EDUCATION MANAGER: Charles Stillman
APDA DIRECTOR: Dave Lingwood

Call -A.P.P.L.E.

EDITOR: Kathryn Hallgrimson Suther
ASSOCIATE EDITOR: Kaiulani Schuler
ART DIRECTOR: Mary Hubert
EDITORIAL ASSISTANTS:
Janine West
Karla Landsverk
TECHNICAL CONSULTANTS:
Walt Gardner
Larry Neibauer
Keith Nemitz
Charles Stillman

ADVERTISING

NATIONAL COORDINATOR:
John Elliott (206) 251-5222
CALIFORNIA REPRESENTATIVE:
JE Publishers' Representative Co.
6855 Santa Monica Blvd., Suite 201
Los Angeles, CA 90038
(213) 467-2266

Call -A.P.P.L.E. (ISSN 8755-4909) is published monthly by Apple PugetSound Program Library Exchange, 290 S.W. 43rd Street, Renton, Washington 98055, (206) 251-5222. Basic subscription price is $21 per year. Membership in A.P.P.L.E. Co-op, which includes magazine subscription, is $26 per year plus a one-time $23 application fee. Additional postage is required for First Class or foreign delivery.

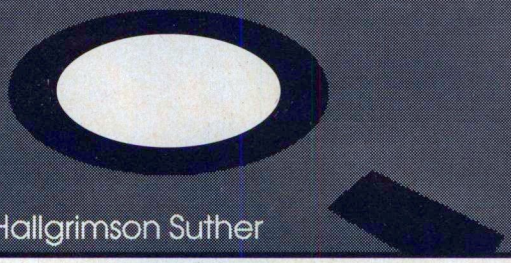
Second-class postage paid at Renton, Washington, and at additional mailing offices. POSTMASTER: Send address changes to *Call -A.P.P.L.E.*, Address Change, 290 S.W. 43rd St., Renton, Washington 98055.

Entire contents copyright © 1987 by Apple PugetSound Program Library Exchange. All rights reserved. Authors and advertisers are responsible for the accuracy of their submitted material. Opinions expressed do not necessarily represent those of A.P.P.L.E. Co-op. Apple users groups may reprint editorial matter contained herein for non-commercial purposes, provided author, title, and publication credits are given. The address and phone number of Call -A.P.P.L.E. should also be included.

A.P.P.L.E. Co-op is an independent support group of Apple product users, and is not affiliated with Apple Computer, Inc. The following are trademarks of Apple Computer, Inc.: Apple, Apple II, Apple II+, Apple IIe, Apple IIc, Apple IIGS, Macintosh, Macintosh Plus, Macintosh XL, Lisa, ImageWriter, LaserWriter Plus, MacPaint, MacWrite, DOS 3.3, ProDOS, AppleWriter, AppleWorks, Applesoft, and UniDisk 3.5.

Printed in U.S.A.

the inside track



Kathryn Hallgrimson Suther

in the lead:

Quoting a phrase from our lead article, **Apple IIGS Graphics Hardware**, "The level of performance that has been squeezed from Apple II graphics by clever programmers is nothing short of amazing." I think this sets the stage for introducing our graphics issue.

Laurence Thompson, a member of the IIGS design team, describes the graphics hardware design of this new computer — its new capabilities and those features of the past worth maintaining through compatibility. This designing goal has made superior new graphics possible, and also enables us to use our old programs with even better resolution.

and... close behind:

Products for the IIGS are slow coming, or perhaps better stated, slow in meeting our expectations. Jeffrey Jacques gives us a look at a new business graphics program in his article, **Visualizer: Business Graphics for the Apple IIGS**. Its strengths and disappointing weaknesses are discussed side by side.

Lucia Grossberger uses Bob Bishops' subroutine module COLORMAP to create animated **Lo-Res Kaleidoscopes.** We learn the mathematics involved, and how to simplify the angles between mirrors for creating similar kaleidoscopes on our II's.

Ken Kashmarek has always been great for analyzing the inner workings of hardware and software. This month his article **Anatomy of the IIGS System Disk**, gives us a thorough description of the ProDOS system disk for the Apple IIGS.

Charlie Stillman, one of our cohorts, is active on GEnie and downloaded the TML Pascal conference held on the Apple II Programmer's and Developer's Roundtable (A2PRO) on Monday February 2. This discussion takes place mainly between the author, Tom Leonard, Michael Fischer, Phil Peterson, and Jim Mensch of Apple. We think you'll find this informative.

Peter and Allen Baum's hardware column continues with **Memory Expansion in the Apple II**.This article discusses the importance of memory expansion and the strengths and weaknesses of two popular cards on the market today.

Bob Bishop brings us back to our graphics theme in his **Modular Assembly Language Part 4.** He introduces a subroutine RWBLOCK which provides easy access to the entire 64K auxiliary memory. His ZOETROPE program uses hi-res flipping to produce its animation.

Michael and Lisa Storrie-Lombardi continue with a closer examination of Object Logo in this month's **Silicon Intelligence,** and we journey to LA for a glimpse at AppleWorld '87, which took place March 2-4. There's more besides, so enjoy!

MEMBER SERVICES

MAIN OFFICE: **(206) 251-5222** • 8:30 a.m. - 4:00 p.m. PST • Customer Service **(206) 251-9798** • Order Desk • Membership Information • Accounting • Dealer Services • Marketing • Testing and Evaluation • Publications • Education

24 Hour Toll-Free Order Line: **1-800-426-3667** (U.S. except Washington state), **1-800-527-7562** (Within Washington State), **1-800-237-4644** (Canada). ORDERS ONLY, INFORMATION NOT AVAILABLE.

Retail Store: (206) 251-6787 • M-F 10:30 a.m. - 6:00 p.m. Sat. 10-5 (PST) Store-related calls only, please.

Programming/Technical Assistance: (206) 251-0071 Call -A.P.P.L.E. HOTLINE • 9:00 a.m. - 3:00 p.m. PST Weekdays.

A.P.P.L.E. Crate Bulletin Board: Wes Munro, sysop (206) 251-0543.

On-line Catalog: GEnie, American Apple Round Table Bulletin Board, category 7. Information call 1-800-638-9636.

Meetings: 7:30 p.m. • 290 S.W. 43rd St., Renton, WA (except as noted). **Co-op** : 3rd Tuesday of month • **Mac SIG** 2nd Tuesday of month • **Educators SIG**: 7:00, 4th Tues. of month • **Amiga SIG:** 2nd Wed. of month • **MS DOS SIG:** 4th Thursday of month.

Membership Information: available on postpaid tear-off card inside.

A.P.P.L.E. CONSULTANTS

Call -A.P.P.L.E. consultants are unpaid volunteers and perform a valuable service. Before placing a call, please make sure you know the time zone you are calling. No calls after 9pm please. Sometimes a consultant will have you leave your name and number and later return your call. In all fairness, please expect the return call to be collect. We are always looking for more consultants. If you see an area that needs coverage, please drop us a note c/o *Charlie Stillman* with your qualifications and availability. The codes to the right of the phone numbers refer to time zones:

P—Pacific	M—Mountain	C—Central	E—Eastern
ie.: 1:00	2:00	3:00	4:00

'C'	PhilPearson	(603) 362-4297	(E)
Accounting (East)	Robert Greco	(609) 884-3047	(E)
Agriculture	Neil Clemmons	(314) 968-9618	(C)
Apple III(Belgium)	Van der Straeten	(015) 205328	
Applesoft	Leon Raesly	days (301) 439-1799	(E)
Applesoft (Austrailia)	Graeme Samways	048-851-541	
AppleWorks	Ina Levinson	days (713) 524-6747	(C)
AppleWorks (East)	Eugene Whitehouse	(201) 434-5110	(E)
AppleWorks (Norway)	Dennis Dahl	04-674-248	
AppleWorks(India)	Arun Nath	660060 ext. 609	
AppleWorks	Leon Raesley	Day(301) 439-1799	(E)
AppleWorks/Business (Israel)	Jeanni Spindel	972-052-83732	
Apple IIc	Leon Raesley's	(301) 439-1799	(E)
Apple IIe (India)	Sanjay Kalra	660060 ext. 610	
Apple III (East)	Carmen Picardi	(603) 895-4447	(E)
Apple III (East)	Harry T. Hanson	(201) 467-0712	(E)
Apple III (East)	Stuart Yusem	(609) 822-9306	(E)
Apple III (West)	Bob Huelsdonk	(206) 542-7122	(P)
Apple III Pascal	Dennis R. Cohen	(818) 956-8559	(P)
Apple IIe (East)	John Hall	(617) 241-9050	(E)
Apple IIGS	Cecil Fretwell	eves (319) 236-0961	(C)
AppleWriter	Leon Raesley	days (301) 439-1799	(E)
AppleWriter	Don Lancaster	(602) 428-4073	(M)
AppleWriter II	Leon Raesley	Dat(301) 439-1799	(E)
Assembly Language	Don Lancaster	(602) 428-4073	(M)
Assembly Language	Scott Zimmerman	(801) 378-4100	(M)
Assembly/CP/M(East)	Dennis Baumgarte	(914) 856-2721	(E)
Assembly/ProDOS	Sean Nolan	(617) 547-1723	(E)
CP/M(PCPI)	Doug Trueman	(417) 679-3526	(C)
CP/M & Wordstar	Leon Raesley	days (301)-439-1799	(E)
CP/M & Wordstar (Southern Africa)	Philip Christensen	(Maseru)311056	
DBASE	Leon Raesly	days (301) 439-1799	(E)
DBASE II (India)	Kalpana Dube	660060 ext. 610	
DOS (South)	Lee Meador	(817) 469-6019	(C)
DOS (West)	William Reynolds	(503)393-6758	(P)
DOS/AppleSOFT Europe	Cornelis Bongers	31-010525511ext.3275	
Education	Ted Perry	(916) 485-1690	(P)
Education Malaysia	Anthony Chan	(06) 711645	
Fortran	Donald Geenen	(414) 734-3904	(C)
Franklin	Doug Trueman	(417) 679-3526	(C)
Geoscience	Tedd Sperling	(517) 393-1296	(E)
Handicapped Applications	Tom Deal M.D.	(206) 634-2847	(P)
Hardware/Am-Euro compatibility	Dennis Dahl	(Norway)04-674-248	
Hardware Design, I/O Control	Stan Axelrod	(415) 563-1840	(P)
Hardware Interfacing	Randy Halvorson	(206) 783-9040	(P)
Hardware Interfacing/Control (East)	Maurice Khano	(404) 924-1371	(E)
Hardware (Australia)	Graeme Samways	048-851-541	
Hi-Res	Ed So	(408) 267-3448	(P)
LaserWriter/Postscript	Don Lancaster	(602) 428-4073	(M)
Lisa	Fred Reitberger	617) 587-9829	(E)
LISP	Frederick Naef	(703) 471-1479	(E)
Logo	Jeff Sandys	(206) 784-3317	(P)
Logo (S. Australia)	Peter Carter	(08) 434298	
Macintosh (Midwest)	Tim Smith	(309) 734-7451	(C)
Macintosh (West)	Don Stinson	(206) 242-2590	(P)
Macintosh (East)	Dennis Baumgarte	(914) 856-2721	(E)
Macintosh (East)	Robert Forras	(516) 328-3433	(E)
Macintosh (East)	William P. Steinberg	(212) 921-0663	(E)
Macintosh (South)	Floyd Rathbun	(615) 865-3011	(C)
Mathematics	Stowe Keller	(804) 971-6876	(E)
Multiplan	Richard Schubert	(716) 352-0837	(E)
Multiplan (India)	Pravin Bhambri	660060 ext. 607	
Music	Stephen F. Lee	(704) 876-3444	(E)
Pascal (East)	Tom Woteki	(202) 547-0984	(E)
Pascal (Midwest)	Tim Smith	(309) 734-7451	(C)
Pascal (South)	Garry Flemings	(205) 279-7474	(C)
Pascal (West)	Paul E. Sleeper	(415) 494-1915	(P)
Pilot	Earl Keyser	(612) 429-5570	(C)
Pilot	Randy Warrens	(608) 837-9566	(C)
ProDOS/Apple IIe	Cecil Fretwell	(319) 236-0961	(C)
ProDOS (West)	William Reynolds	(503) 393-6758	(P)
Small Business/Cash Register comms	Michael Lipay	(412) 795-7673	(E)
Spreadsheet	Robert Greco	(609) 884-3047	(E)
Spreadsheets	Jeffrey Jacques	(904) 385-7947	(E)
Spreadsheets	Leon Raesley	Day(301) 439-1799	(E)
Statistics/Educ	Rich Hofman	(513) 529-4420	(E)
Stock Market	Robert Wood	(703) 893-9591	(E)
Visicalc (East)	George L. Hefter	(617) 256-3082	(E)
Visicalc (North)	Vince Aderante	(312) 289-9685	(C)
Visicalc (South Africa	Brian Abrahams	(Durban)315442	
Visicalc (South)	Dr. Bob Richard	(504) 466-0894	(C)
Word Processing	Leon Raesly	days (301)439-1799	(E)

Apple IIGS Graphics Hardware

Laurence A. Thompson

The charter of the Apple IIGS design team was to take the Apple II line of computers to its next evolutionary plateau — to create a machine featuring greater processing speed and more memory, and significant improvements in sound and graphics. At the same time, the machine had to be an Apple II, meaning that it had to be software and hardware compatible, expandable, and affordable. The result is that the Apple IIGS not only supports the graphics capabilities of its forebearers, but enhances them and adds new high resolution color graphics modes.

'The main display modes of the GS can be divided into two groups: Apple II compatible modes, and the new super hi-res graphics.'

This article will describe the graphics capabilities of the Apple IIGS hardware. Comparisons will be drawn between the graphics technology of the GS and that of other members of the Apple II family. The intent is to provide some insights into the reasons for the graphics hardware design of the newest Apple II.

System Overview

Think of the GS hardware as having a IIe embedded as a subsystem. Apple IIe hardware is implemented in the GS with a custom chip called the Mega II, and a companion chip called the Slotmaker. Hardware on the Mega II side of the GS system runs at the same clock rates as earlier Apple II machines, about 1MHz. This insures hardware compatibility for expansion cards, and maintains Apple II video timing. Expansion slots, other input/output devices, and video display buffers are mapped into the Mega II side of the GS system, allowing clean and unobstructed memory expansion on the fast side.

The fast side includes the 65C816 microprocessor, some memory, and another custom chip called the Fast Processor Interface (FPI). The FPI controls the microprocessor's clock rate at either 2.8MHz or 1MHz.

If the processor runs out of RAM or ROM on the fast side, then the clock rate will be 2.8MHz (unless the user selects the slower clock rate from the control panel). On the other hand, if the processor addresses a location on the Mega II side of the system, then the FPI will slow the clock speed to 1MHz, synchronize with the Mega II side long enough to transfer data, and speed up again.

The slowing of the processor clock is handled by the FPI in a way that is transparent to software. The scheme offers two advantages — Apple II hardware compatibility is maintained, and the processor can run faster.

Software compatibility is maintained by two hardware features: Emulation and Shadowing. Emulation means that the 65C816 can be switched into a mode in which it works like a 6502 microprocessor. Shadowing allows Apple II software to be loaded into memory on the FPI side of the system and run faster. A few of the slower processor cycles are needed for input/output or for writes to the display buffers on the Mega II side, but these make up a small percentage of the total — the effect of the slower cycles is usually negligible.

The many display modes of the GS

can be divided into two groups: Apple II compatible modes, and the new super hi-res graphics.

Apple II Compatible Graphics

Apple II compatible graphics and text modes include all the display options of earlier Apple II machines. These include 40 and 80 column text, lo-res graphics (40x48, 16 colors), double lo-res graphics (80x48, 16 colors), hi-res graphics (140x192, 6 colors), and double hi-res graphics (140x192, 16 colors).

The Mega II adds two more modes that were not available on other Apple IIs: monochrome hi-res (280x192, black and white), and monochrome double hi-res (560x192, black and white).

All of the graphics modes can be displayed in a mixed text and graphics format. Mixed modes permit the lower 32 scan lines of a graphics screen to be replaced by four rows of text. The text may be either 40 or 80 column, except when using double lo-res or double hi-res graphics — in this case the text must be 80 columns.

The hardware implementation of these graphics and text modes is considerably different on the Apple IIGS than on other Apple IIs. The result is that graphics software written for other Apple IIs should look better on the GS.

To understand why, we need to look at color graphics generation on other Apple IIs and compare them to the GS.

Composite Video and the Apple II

It could be argued that the ingenious color video generation scheme of the original Apple II played a significant role in launching Apple Computer, Inc. The Apple IIs were designed to use television sets for display and were capable of producing 16 colors. The design was remarkable, because it used very little hardware — keeping the cost down. The Apple II technique for generating a composite video signal has been used on every Apple II model (except for the Apple IIGS) since its creation. A discussion of composite video is now necessary.

The composite video standard used in North America is called NTSC (National Television Standards Committee). There are at least three types of information encoded onto the composite signal: synchronizing information, luminance, and chrominance.

Synchronizing information (sync) are pulses spaced in time at regular intervals. These pulses control the horizontal and vertical retrace in the monitor, so they synchronize the monitor to the stream of incoming video information.

Luminance is brightness information and is sent to the monitor by the voltage amplitude of the composite video signal. This means that the brightness of the display is proportional to the voltage level of the video signal. Black and white monitors and TV sets need only luminance and sync information to display a monochrome or gray-scale image.

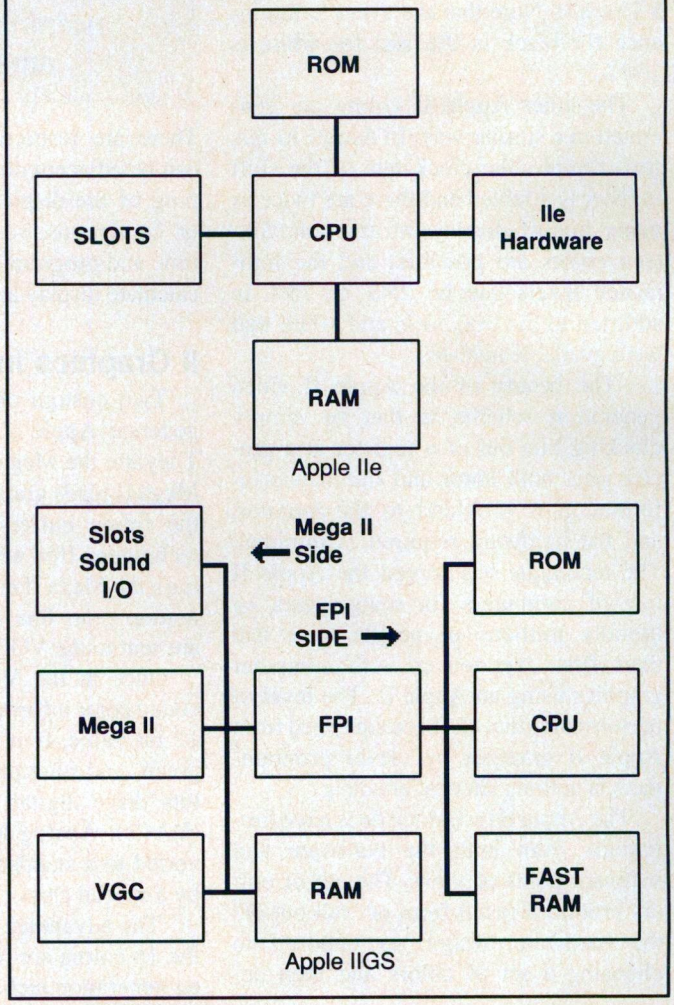
Chrominance (also called chroma) or color information is encoded using phase modulation. During the horizontal blanking period, the color reference signal is sent to the monitor where it controls a color reference oscillator. This is called color burst or burst phase. Chroma information is mixed onto the video signal during the time that the display is scanned. This chroma information is a signal of the same frequency as the color burst, but it is phase shifted relative to the burst phase. It is this shift that provides hue information.

Another element of color information is called saturation. For example, it is possible to have two red colors that have the same luminance or light intensity, but one may be a vivid red while the other is more pink — the vivid red is more saturated than the pink. The saturation of a color is determined by the amplitude of the chroma signal.

The chroma signal "rides" atop the luminance level. In color monitors, there are circuits that detect the chroma frequency, and other circuits that detect the voltage level of the luminance signal. The luminance circuits do not respond to the chroma frequency because of special filtering. Instead, the luminance circuits tend to respond to the average of the chroma voltage level. This is a key concept in understanding how the Apple II generates a color video signal.

Up to this point we have been discussing the NTSC standard for composite video. The Apple II generates a signal that works on an NTSC monitor, but is not standard NTSC. As an example, let's look at the way in which the Apple II generates hi-res color video. Eight bits of video data are read from the display buffer and the lower seven bits are loaded into a shift register. Now, if

FIGURE 1:
Apple IIe, Apple IIGS Block Diagrams



the bits have an alternate 1,0 or 0,1 pattern, and they are shifted out at exactly two times the color reference frequency, then the frequency of the bit stream will be equal to the color reference frequency. The bit stream is mixed with a sync signal to produce the Apple II composite video signal. Setting the high bit (the one that is not loaded into the shift register) to a 1 causes an additional phase shift of 90°, resulting in more colors.

You can see from the previous discussion how the Apple II generates color information, but what about luminance? Recall that the circuits in the monitor which detect luminance levels tend to respond to the average voltage level at the chroma frequency. The average voltage level is about halfway between a high or low level, for a luminance average of about 50%. Black results from at least two adjacent 0s and white from at least two adjacent 1s. In this case, the high or low is held long enough for the luminance circuitry to recognize the level. For this reason, black and white can be generated if the most significant bit of a display byte is a 1 or a 0. Note that the average luminance for black is 0% and for white is 100%.

The other Apple II colors are generated in a similar way. In double hi-res, for example, the clock rate of the shift register is doubled and there are twice as many bits of display information. Sixteen colors are possible, and the luminance levels can be 25% or 75% in addition to the 0%, 50%, and 100% that were available in hi-res.

The beauty of the Apple II video generation scheme is that by simply clocking bits out of a register at a precise rate, both color and luminance information is provided to the monitor, and the hardware required is minimal. The technique has served the Apple II line of computers for many years — literally millions of people have had their first experiences with computer graphics using an Apple II. The level of performance that has been squeezed from Apple II graphics by clever programmers is nothing short of amazing.

The Apple II technique does have limitations from both the hardware and software point of view. The set of colors produced result from or "fall out of" the hardware design, as opposed to choosing a set of colors and then designing hardware to produce them. The average luminance levels are fixed, as are the amplitude levels of the chroma information. As a result, the colors are not saturated so they are not as bright or intense as they could be. Some of the frequency components of the chroma information show up on the display as vertical lines or variations in color intensity, producing colors that are not solid. Also, the Apple II composite signal is non-standard so that it doesn't always record well on video recording machines.

Programmers have to deal with many inconveniences. The pixels (picture elements) are not fully contained within byte boundries. For example, in the hi-res graphics mode, a colored pixel uses two bits, but seven bits of each byte is actually sent to the display, so there are three and a half pixels per display byte.

'The level of performance that has been squeezed from Apple II graphics is nothing short of amazing.'

There are restrictions on which colors can be adjacent on the screen. The mapping of the display buffer is not linear or contiguous, so that more processor time and programmer effort is needed to calculate display addresses.

II Graphics in the GS

Two custom chips work together to generate Apple II graphics in the GS. They are the Mega II and the VGC. The Mega II reads graphics information from the frame buffers. Then using digital techniques (for which a patent is pending), the Mega II encodes the color information onto four output signals which are sent to the VGC.

Once in the VGC, the four bit encoded color information is converted to a 12 bit value, four bits each for the red, green, and blue primary colors. The 12 bits drive digital to analog converters (DACs). Analog RGB signals are converted to a standard NTSC video signal by a special chip.

The advantage of this method is that the 16 colors are not limited by the video generation technique of the Apple II. The GS designers had the opportunity to "jazz up" the Apple II color set. Therefore, Apple II compatible software running on the Apple IIGS looks better.

The VGC adds three more enhancements. First, the VGC has enough intelligence to "know" the current display mode. If the machine is operating in either 40 or 80 column text mode, then the VGC will add color to the text and the background area. The colors are selectable from among the 16 Apple II colors built into the VGC. Second, a border color is selectable from the same set of colors. The border is the space around the perimeter of the image or text. Third, the VGC can remove the color burst and chroma information from the composite video signal. This benefits users with monochrome monitors because it permits all of the graphics modes of the Apple IIGS (including the new super hi-res modes) to be displayed in shades of gray.

New Super Hi-res Graphics

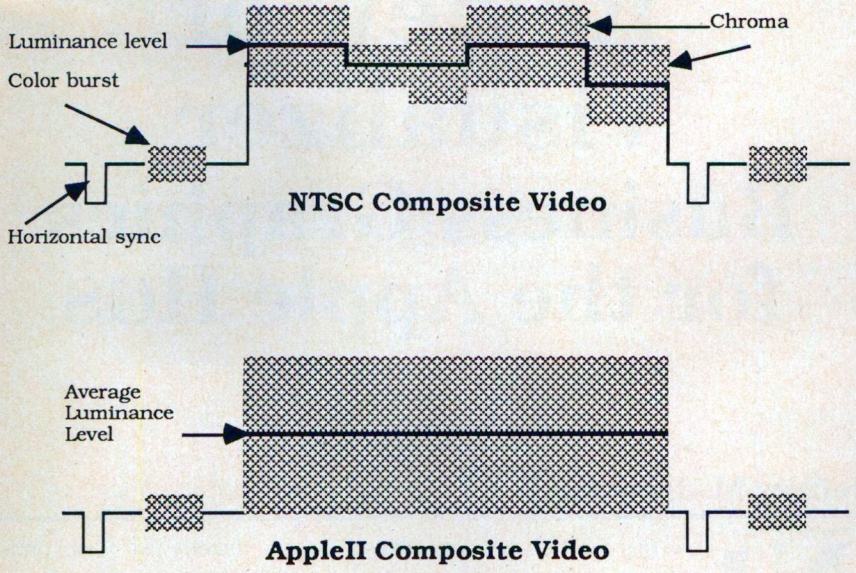
The Apple IIGS sports some new higher resolution color graphics modes. The features of these new modes include 320 x 200 and 640 x 200 resolution, with 16 colors per line. There are 4096 possible colors.

The display buffer uses 32,768 (32K) bytes of memory and is mapped into bank $E1 from $2000 to $9FFF (the $ symbol means that the numbers are hexadecimal). This area of the memory map was chosen because it does not interfere with the buffers for the Apple II compatible display modes. If the machine is operated in Apple II emulation mode, then the display buffer is in the Auxiliary 64K.

There are three types of information in the display buffer: The largest area, the bit map, is exactly 32,000 bytes. The 320 and 640 resolution modes use four or two bits per pixel respectively, so that the pixels are wholly contained within bytes. The bit map is linear and contiguous.

The area of the display buffer from $9D00 to $9DCF contains the Scan Line Control Bytes (SCB). There is one control byte for each of the 200 scan lines — all of the display options for the super hi-res modes are programmable for each individual scan line. The options include 320 or 640 horizontal

FIGURE 2:
Comparison of NTSC standard video with Apple II video signal.



resolution, color palette, color fill mode, and scan line interrupt.

Finally, the addresses from $9E00 to $9FFF contain 16 color palettes. There are 16 colors in each palette for a total of 256 colors. An individual color is specified by 12 bits, so that the total number of displayable colors is 2^{12} or 4096.

If the 320 mode is selected, then the color of each pixel is determined by four bits — each pixel can be any of the 16 colors available for the line. If the 640 mode is selected, then the color of each pixel is determined by two bits — each pixel color can be one of four colors. However, it is possible to display more than four colors on a 640 scan line.

The 640 mode supports a color dither scheme. This is best described by an example. A line of pixel colors that alternates between red and green will be perceived as a solid yellow. The reason is that the pixels are so tiny that the eye will blend the two colors. The advantage of the technique is that more than four colors can be generated, even though there are only two bits per pixel. This could be used in an application in which a colored image is mixed with sharp 80 column text. Of course, a simple 640x4 color display is also possible.

Color fill is an option available in the 320 mode that permits areas on the display to be filled by a solid color. If color fill is enabled for a line, then the pixel value of 0 takes on a new meaning. Rather than indexing color 0 in the palette, a 0 pixel means "repeat the last color". This feature may be useful for rapidly moving objects which have large areas of a single color.

A processor interrupt may be generated at the beginning of any of the 200 scan lines using the Scan Line Interrupt bit in the SCBs. Software can be synchronized to the display scanning, effectively increasing the time available for updating the buffer and assisting flicker free animation.

The super hi-res graphics offer more resolution, colors, and flexibility than ever before on an Apple II computer. There is more to super hi-res than just hardware features — the Apple IIGS also comes with a built-in set of powerful graphics tools, collectively known as Quickdraw II. These tools make the job of the graphics programmer much easier.

The Apple IIGS builds upon the strengths of the Apple II. The GS design takes advantage of new technologies to bring powerful and exciting new features to the Apple II family.

Please rate this article on the Reader Service Card by circling:

51 Excellent **52** Good
53 Fair **54** Poor

FROM THE AUTHORS OF
Beneath Apple ProDOS
NOW THERE'S . . .

Bag of Tricks 2™

By Don Worth and Pieter Lechner

***Bag of Tricks 2** does everything the original **Bag of Tricks** did . . .*

- ***WORKS** with DOS 3.3, DOS 3.2, Pascal, and CP/M diskettes.*
- ***REPAIRS** damaged diskettes.*
- ***RECONSTRUCTS** blown catalogs.*
- ***EXAMINES** and **MODIFIES** disk data.*
- ***CONTAINS** full documentation, with **TUTORIALS.***

***PLUS** these **NEW** features:*

- *Also operates with **ProDOS.***
- *Operates with the **PROFILE*** and **SIDER*** hard disks and with the new **3½" FLOPPY DRIVES** and most **RAM CARDS.***
- ***NOT COPY PROTECTED.***
- ***ONLY $49.95** for all four programs, on 5¼" diskette. Requires 64K.*

NOTICE to owners of
Bag of Tricks 2

Version 2.1, a substantial upgrade to Bag of Tricks 2, is now available. Registered owners may call and order the upgrade for $15 plus shipping and handling.

***ALSO** from Quality Software:*

***Beneath Apple DOS** by Worth and Lechner*
*Covers all facets of DOS 3.3 and previous Apple disk operating systems. Book. **$19.95.***

Beneath Apple ProDOS
by Worth and Lechner
*They've done it again! This time for ProDOS, Apple's new disk operating system. Book. **$19.95***

***Understanding the Apple II** by Jim Sather*
*Foreword by Steve Wozniak. Covers Apple II and Apple II Plus hardware, including the disk controller. Book. **$22.95***

***Understanding the Apple IIe** by Jim Sather*
*Similar to Understanding the Apple II, this book covers Apple IIe hardware. **$24.95***

Universal File Conversion
by Gary Charpentier
*Moves files from any standard operating system on the Apple to another. Works with DOS 3.3, CP/M, ProDOS, and Pascal. Unprotected disk. **$34.95***

QS QUALITY SOFTWARE

21610 Lassen St., #7
Chatsworth, California 91311
(818) 709-1721

Ask for Quality Software products at your computer store, or send the price of the software **plus** $2.50 for shipping and handling (**plus** 6% sales tax if a California resident) to Quality Software. VISA and MasterCard holders may phone their orders.

**Apple and Profile are trademarks of Apple Computer, Inc. Sider is a trademark of First Class Peripherals.*

CIRCLE **16** ON READER SERVICE CARD

Review of Visualizer
Business Graphics for the Apple IIGS

Jeffrey M. Jacques

Product: Visualizer
Company:
PBI Software, Inc.
1163 Triton Drive
Foster City, CA 94404
(415) 349-8765
List Price: $99.95
CIRCLE **60** ON READER SERVICE CARD

Now that the IIGS is here, software houses are lined up at the starting gate rushing to be in front of the pack by releasing early quality software. These software houses will be developing new software and/or modifying existing software to take advantage of the extended GS graphics and power. Each new package can be expected to out perform previous related software which ran on the II+ or IIe/c. One should also expect that many of these packages will have one or more bugs, and limited access to hardware peripherals. The Visualizer, a first generation business graphics package from PBI Software, Inc., is just such a package.

The $99.95 Package

What I received to review from PBI Software was a 3 1/2 inch program diskette, a final draft form of the 26 page manual, and a letter indicating that the software is a "business graphics program designed specifically for the new Apple IIGS. It enables the user to produce quality graphs from AppleWorks' spreadsheets or through Visualizer 'datasheets.' It uses all the advances of the new computer including super hi-res, color, speed, and it incorporates the Macintosh style interface."

The diskette came with the Vis.Sys16 program, Version 1.04 which required an Apple IIGS and 512K RAM. (The Vis.Sys16 program file size was 200 blocks in length.) While you can use a monochrome monitor, an analog RGB monitor gives the most impressive results. If you plan to send any of these graphs directly to your printer, check your printer type, since the ImageWriter is currently the only printer supported by this program.

With the graphics program, you also get a simple worksheet program and data which is to be used with the tutorial part of the manual, and several background logos that may be used in conjunction with your business graphs. You can create the usual complement of univariate and bivariate graphs, including: pie charts, bar graphs, line charts, high-low graphs and scattergrams. For those interested in 3-dimensional charts, this option is available, too. However, no multi-variate graphing, a la *MacSpin*, is supported.

A Test Drive:
Documentation & Tutorial

In loading the diskette from a cold boot, the program operated just as the manual described. I found that I was greeted with the usual Mac-like interface with pull-down menus, easily accessible files via the usual information box, and the ability to produce good looking graphics quickly and with ease. All I had to do was to load what appeared to be a standard spreadsheet worksheet file, highlight the data within the worksheet I wished to graph, and select the graph type (Figure 1).

The software and the IIGS quickly produced the desired graph (Figure 2). I was able to easily create each of the graph types noted above, and add titles and legends. Titles, legends, and text were moved from the default location on the screen with ease to any other location by simply clicking the mouse button on

FIGURE 1. Visualizer Worksheet Display

Standard Display

	A	B	C	D	E
1		1980	1981	1982	1983
2	Sales(m)	11	20	20	18
3	Expns.(m)	5	10	9	9
4	Profit(m)	6	10	11	9
5					

Selected (Highlighted) Area

(B2..E4)

	A	B	C	D	E
1		1980	1981	1982	1983
2	Sales(m)	11	20	20	18
3	Expns.(m)	5	10	9	9
4	Profit(m)	6	10	11	9
5					

FIGURE 2. Color 3-D Bar Graph

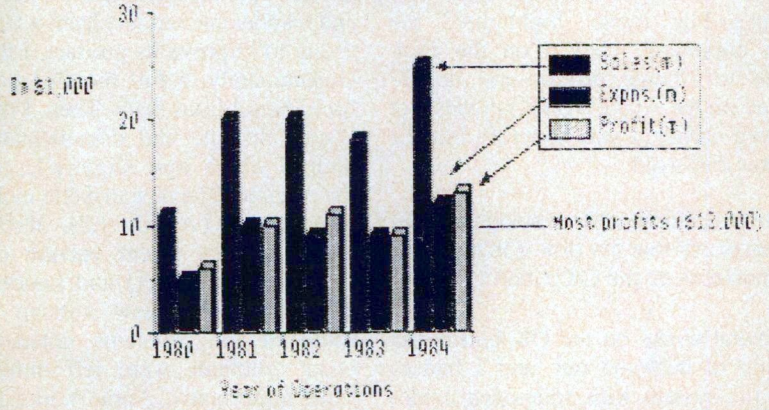
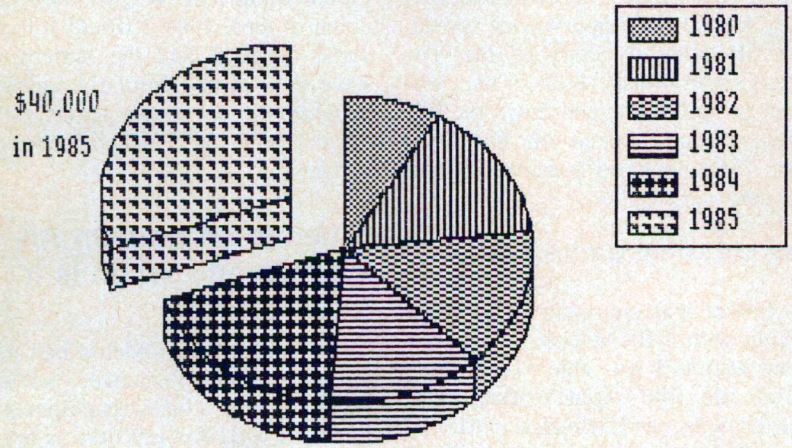


FIGURE 3. Exploding Pie Chart



the appropriate text, dragging it to its new location, and releasing the mouse button.

Similarly, I was able to stretch or shrink what was displayed on the screen by clicking on the object of interest, grabbing a highlighted handle and moving it in the appropriate direction.

I was unable, however, to get the label for the Y-axis to list vertically. Nor was I able to have several independent graphic images display at the same time, a la *Excel;* such an option would have made my final graph choice easier. With the Visualizer, each new graph replaced what was already drawn and required, therefore, either saving/loading or recreating the previous graph of interest was required.

Perhaps this is a good time to note some of the design limits of Visualizer. First, the software will allow up to 52 data points in a range and up to 24 ranges for some graphs. You could, therefore, have 52 weeks of data on 24 different variables, e.g., profits, sales, R&D Expenses, etc., all displayed on the same graph. (Of course, using all 24 variables on any single graph will make it less than ideal for interpretative value). Each cell can contain either labels or values and each cell's contents may be as long as 9 characters, whether these characters are alpha strings or numeric values. While it is unlikely that you will ever need to graph values greater than 999,999,999, your labels may exceed this nine character limit. You will probably need to develop mnemonics and abbreviations for many labels.

Power & Performance :

How It Knows What To Graph?

The Visualizer graphs the data on the basis of the graph type chosen and the shape of the highlighted spreadsheet area to be graphed: when the column length is greater than or equal to the row length, then the data are separated into columns and the legend titles come from the column headings. Where row length is greater than column length, the data are separated into rows of data and the legend comes from the left hand side of each row.

Automating the assignment of variable labels has its advantages and its disadvantages. While this title automation procedure described above works pretty well for most applications (e.g., Figure 3), you can run into trouble when you have several ranges all of which use row 1 for the labels. Here's a typical example. Row 1 has the header you wish to use, e.g., year label, row 2 has the sales data, and row 3 has the expense information. A graph of the sales data (row 2) will be correctly labeled since row 1 contains the appropriate year labels. But in graphing a pie chart of the expense data, data contained in row 3, the Visualizer assumes that the

labels can be found in row 2 (sales data) rather than row 1 (year labels) (Figure 4). Extra effort is required on your part to make sure that the data matches the appropriate labels.

Visualizer Data Entry

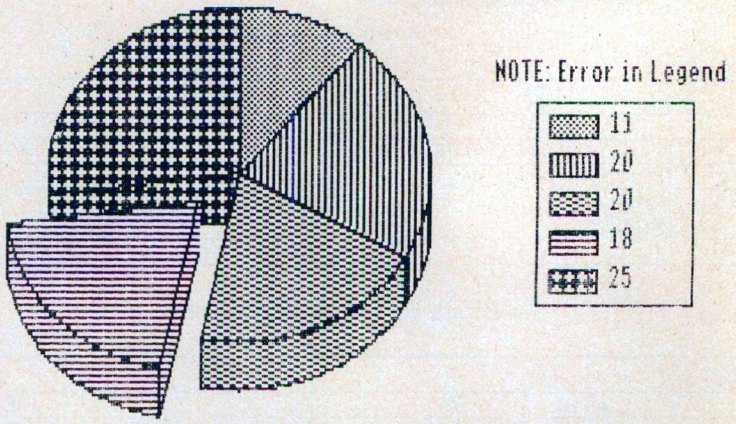
Data entry may be accomplished directly by using one of its worksheet templates or by importing an AppleWorks spreadsheet file. Under ideal circumtances, I would suggest the second choice for most users since the Visualizer's worksheet templates may look like a spreadsheet. it has its columns labeled with A, B, C, etc., and the rows labeled with 1, 2, 3, etc. — but that's about all it has in common with spreadsheet software. You will find none of the standard functions for summing or averaging a row or column of numbers. Similarly, you will not find any commands which will allow you to easily manipulate the display or format of the worksheet. Finally, each cell can work with a maximum of nine characters — whether they be numbers or labels, so all your spreadsheet entries must be standarized within these limits.

The AppleWorks Connection

Since the Visualizer's documentation claimed to have easy access to AppleWorks spreadsheets and Mac-like qualities, I thought that I would make one of my mini-disks an AppleWorks/Visualizer composite disk. I figured that all I needed to do was to load my system software, copy all the files from my composite disk to my 1 megabyte RAM disk, boot AppleWorks, create my spreadsheets and then easily go to the Visualizer software for graphing. Having all my important software in RAM at the same time seemed like a good idea, until I tried to boot my Visualizer program.

I clicked on the RAM disk, doubled clicked on the Vis.Sys16 program, got a brief message about ProDOS 16, and then crashed into the monitor. Even trying to run the Visualizer program directly from the Visualizer software diskette using the Desktop or Program Launcher gave me the same error. (My early dreams of easy movement from AppleWorks' spreadsheet files to Visualizer graphics seemed doomed.) Alas, while the software had Mac-style pull down menus, it did not have compatibility with the IIGS desktop application! While this may not be extremely important right now, it will be in the future with one or more switcher programs becoming available.

FIGURE 4. Pie Chart of Expense By Year



Well, I took the next step, warm booting Visualizer from slot 5 and keeping my AppleWorks' spreadsheet file in slot 6, drive 1. I pulled down Visualizer's File menu, highlighted the Open command, clicked on the Disk button to change drives, and double clicked on the AppleWorks' spreadsheet (I saved earlier. I was hopeful), but the monitor displayed:

"An error occurred while reading the file. Please check that the disk is in the drive and then click on the OK button."

Several clicks on the OK button did nothing to help me out, and I had to reset the system with cntrl-open apple-reset keys. I then tried to load the AppleWorks' spreadsheet file from the RAM disk. Unfortunately, I still got the same error message. Out of frustration I finally loaded the AppleWorks' spreadsheet file onto my copy of the Visualizer system disk, booted the Visualizer program, dragged down the File command, and clicked on the Open button. Still with no success and the same error message to

"check that the disk is in the drive"

This failure was suprising since I was working with a RAM disk. It was surprising also as I was able to read their tutorial file into AppleWorks, make some changes, and reload it into Visualizer. Unfortunately, I was unable to load any of my AppleWorks' spreadsheet files direclty into Visualizer.

Product Support

When I ran into these problems, I called PBI Software, Inc. To say the least, they were surprised. They offered to send me a new updated disk and requested that I return my Visualizer diskette and a copy of one of the AppleWorks' spreadsheet files. A reasonable and responsible request from a company trying to improve its product, I thought. Unfortunately, a full month lapsed before I heard from them. Then, I received a new diskette and documentation — both of which were slightly larger than the original. The new diskette included a new version (version 1.5), of the program, a more recent version of ProDOS16 (version 1.1) and Loader (version 1.1). This new version solved some of the problems noted above; other problems were left unresolved. Most importantly, AppleWorks' spreadsheet files (while still in AppleWorks' format) still did not load successfully all the time. (Some of my files would load, others would not. When I tried to open some of these files, I would still get the same message and the system would have to be reset.) Similarly, quitting the program did not always return me to the system point from which I entered the program.

When is an Add-On An Add-On and When Is it Integration?

Even if these problems had not occurred, would Visualizer accomplish what I need in a business graphics package? If I used AppleWorks as my basic business application software, then any add-on package should be easily accessible from AppleWorks (e.g., *Super MacroWorks, Pinpoint products,* etc.), not the other way around. With the additional power and memory of the IIGS, I

would expect to reach any AppleWorks add-on with the press of one or two keystrokes. These keystrokes should automatically load the current spreadsheet file into the application and then perform its function, in this case graph the values with high quality output. Without easy access to spreadsheet functions and worksheet commands, graphic programs can become more of a frustration than an asset. Just think of the number of times you change your mind on how to graph any variable (e.g., using actual values, transformed values, collapsing several categories into summary categories, etc.). With Visualizer, each one of these changes required the user to exit Visualizer, reboot AppleWorks, rework the spreadsheet, reload Visualizer, load the altered worksheet file, and finally repeat the required commands to produce the desired graph. This simply requires too many steps!

Summary

With the addition of the GS to the Apple II family of computers, we can expect a wide array of software claiming to use its power, sound, and/or graphic capabilities. While the producers of this new business graphics package accomplished the goal of easily producing high quality graphs and charts, they fell short in enabling the user to integrate powerful graphics with AppleWorks and the IIGS system.

In closing, I am reminded of Orson Wells' Gallo commercial statement of several years ago. While holding a glass of wine, Wells stated that Gallo "will release no wine before its time". Unfortunately, PBI Software released Visualizer...

Author's Note: For those interested, I am using an Apple IIGS with a 1 megabyte RAM card, one 3 1/2 inch drive, one 5 1/4 inch drive, a black and white GS monitor, and an Epson FX-185 printer. I believe that this configuration (IIGS with 1 MEG of RAM) would give me the best cost/performace options for the type of business work I do. Additional tests of the software were performed with an Apple IIGS color Monitor and ImageWriter printer.

Please rate this article on the Reader Service Card by circling:

61 Excellent **62** Good
63 Fair **64** Poor

SONY®

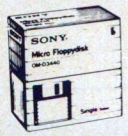
3.5" DISKETTES

(Certified by Apple for MacIntosh™)

THE INVENTORS OF THE 3.5" DISK DRIVE RECOMMEND ONLY ONE FLOPPY DISK . . . THEIRS

ON SALE NOW

Sony, the originator of the 3.5" format, set a very high standard for their micro floppydisks. A standard few have been able to match. Performance, quality and durability have made Sony the first choice in floppydisks.



Price Per Diskette

	SS	DS
Box	1.24	1.79
Bulk	—	1.39

100% ERROR FREE
Min. Order: 50 Disks

QUALITY PRINTER RIBBONS

Apple Imagewriter ..... **$3.95 ea.**
Epson LX 80/90 ..... **$2.95 ea.**
Epson LQ 1000 ..... **$4.95 ea.**
Okidata 80/82/83 ..... **$1.49 ea.**

Sold 6/Box (Minimum)

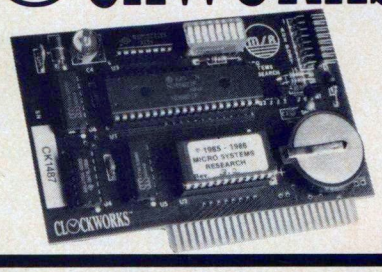
Min. Order $25.00. S&H: Continental USA: $4.00/100 or fewer disks: discount at 300. Ribbons $.25 each. Foreign orders APO/FPO, please call. MI residents add 4% tax. Prices subject to change without notice. Hours 8:30 AM - 7:00 PM.

VISA MasterCard

Precision Data Products™
P.O. Box 8367, Grand Rapids, MI 49518
(616) 452-3457 • Michigan 1-800-632-2468
Outside Michigan 1-800-258-0028

CIRCLE **11** ON READER SERVICE CARD

CLOCKWORKS®



The most powerful full feature real time clock EVER designed for the Apple!

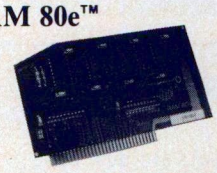
The new ClockWorks card is not just another clock based on the same old IC used in Timemaster HO, Proclock, Versacard, Multi I/O and many others, but rather a new and innovative ground-up design with new technology that gives you all the features you'd expect from a high quality product, all the compatibility you must have and above all, additional capabilities not available with any other clock. Just compare and find out why ClockWorks is the only clock/calendar card you should obtain for your Apple™.

FEATURES	CLOCKWORKS®	TIMEMASTER™	THUNDERCLOCK™
ADDS THE TIME AND DATE TO APPLEWORKS SCREENS AND FILES	YES	YES	NO
SET THE TIME PRECISELY TO ANY EXACT SECOND.	YES	NO	YES
LONG LIFE LITHIUM BATTERY, ALWAYS WORKS, NO RECHARGING IS EVER NEEDED.	YES	NO	NO
INCLUDES A DIGITAL I/O PORT FOR ADVANCED APPLICATIONS.	YES	NO	NO
EXTERNAL SOURCE INTERRUPTING AND FLAGGING.	YES	NO	NO
BUILT-IN TIME SETTING COMMANDS	YES	NO	YES
CLOCK PRICE	$99.00	$129.00	$149.00
BSR REMOTE CONTROL OPTION	$29.00	$39.00	$49.00

ClockWorks has 24 hour & AM/PM modes, software selectable interrupts, time & date stamps, ProDOS, DOS 3.3, and Pascal files, and comes complete with four disk sides full of useful software, including "The Time Machine", a new powerful disk based appointment book/time management system written especially for ClockWorks.

ClockWorks is the registered trademark of Micro Systems Research. Apple, Proclock, Timemaster HO, Multi I/O, Versacard are respective trademarks of Apple Computer, Practical Peripherals, Applied Engineering, AST Research, Prometheus Products.

RAM 80e™



- Extends the Apple *IIe* to 128K RAM
- Adds crisp 80 column video display
- Enhances spreadsheet and wordprocessor viewing
- Allows double high resolution graphics
- Acts as high speed disk drive with ProDOS.

Easily installs in the Aux. slot of the Apple *IIe*. Comes with full documentation. _____ **$79.**

MSR DRIVE™

Full height, 5¼" disk drive for the Apple *II+*, *IIe* & *IIGS*. 100% compatible with all software. Completely operational as data or boot drive even with protected software. Plugs into any standard disk controller card. Includes 1 year warranty.

MSR Drive _____ **$129**
Controller card _____ **$49**

EXTEND-50™

Reliably extends all 50 signals at internal slots to a 50 pin DIP. One side plugs into an Apple slot, the other plugs into any breadboard/protoboard. Now you can easily wire an interface card circuit without tedious wirewrapping or soldering techniques. A must for every designer.

Only _____ **$34**

All expansion cards include full documentation, 5 year warranty, 15 day money back guarantee and are available for immediate delivery.

Now available at your favorite dealer. To order send CHK/MO plus shipping (USA $2.50 plus $.50 for each additional unit, Canada $5.00, Other $10. VISA, MC, COD welcome).

To order call toll free
1-800-233-5767

For information & GA orders
404-928-9394

MICRO SYSTEMS RESEARCH
4099 Maxanne Drive, Kennesaw, GA 30144

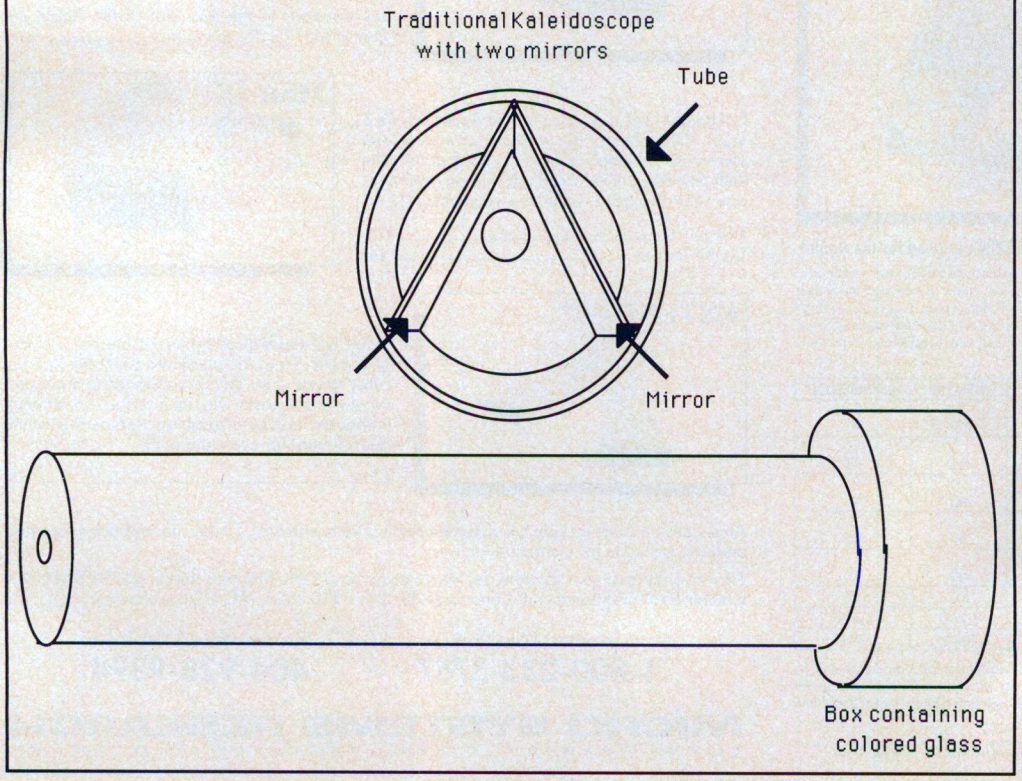
Lo-Res Kaleidoscopes

Lucia Grossberger and Bob Bishop

The January issue of *Call-A.P.P.L.E.* (pages 22-25) presented a subroutine module (COLORMAP) for changing each color pixel on the lo-res graphics screen into a new color. In this article, we will see how the COLORMAP module can be used to create "animated" lo-res kaleidoscopes. What is a kaleidoscope?

A simple kaleidoscope consists of two mirrors which meet at a 60 degree angle. The mirrors are enclosed in a tube containing a viewing hole at one end. At the other end of the tube is a small box containing pieces of colored glass. (Figure 1) When seen through the viewing hole, the pieces of colored glass are reflected by the two mirrors to form a hexagonally symmetrical pattern of colors.

FIGURE 1



We could, in principle, simulate such a simple kaleidoscope on the Apple computer. However, simulating reflections from mirrors at a 60 degree angle would require doing calculations involving the square root of 3 — an irrational number. Consequently, such a kaleidoscope would appear to be somewhat "imperfect" due to roundoff errors. (The positions of the reflected images would not coincide exactly with the fixed pixel positions of the Apple's raster-type screen.) In addition, the complexity of the calculations would cause such a program to run needlessly slow. However, if we simply change the angle between the mirrors to 45 degrees (instead of 60 degrees), all the calculations become much simpler as they now involve only integer arithmetic. Consequently, the reflected images of any point

whose coordinates are integer all correspond to exact pixel locations on a raster screen. In addition, the image becomes richer since we now pick up two more reflections.

Let's forget lo-res graphics for a minute and imagine a kaleidoscope (with 45 degree mirrors) looking at a point in the Cartesian plane. Assume that the mirrors intersect each other at coordinates (0,0) and that one of the mirrors is aligned with the x-axis. (Figure 2) Then, any point (x,y) contained between the mirrors will produce 7 reflected images at coordinates:

(+x,-y)
(-x,-y)
(-x,+y)
(+y,+x)
(+y,-x)
(-y,-x)
(-y,+x)

These 7 reflected images, along with the source point at (x,y), constitute the eight symmetry points for any (x,y) source point.

The Lo-Res Kaleidoscope Modules

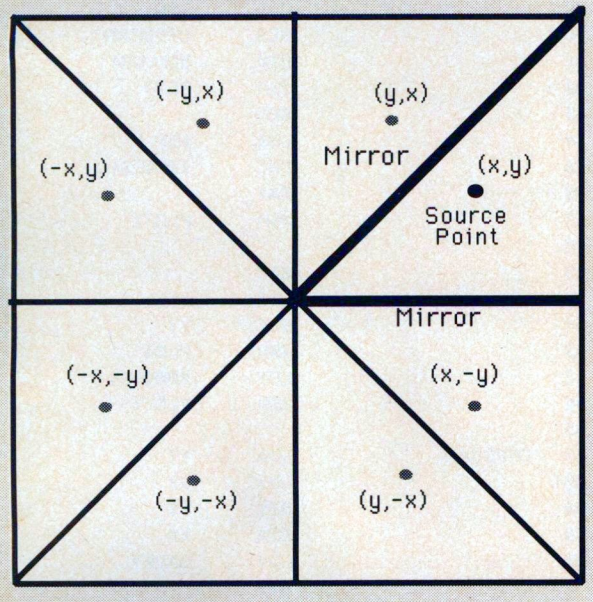
One of the simplest ways to generate a lo-res kaleidoscope would be to perform the following steps:

Step 1	Clear the lo–res graphics screen.
Step 2	Select an initial (x,y) source point on the lo–res screen.
Step 3	Plot the eight symmetry points for (x, y)
Step 4	Move from (x, y) to one of its eight nearest neighbors.
Step 5	Go to Step 3.

Step 1 is performed by the GR48 module whose source code is shown in Listing 1. (The documentation for this module is shown in Table 1.) Subroutine GR48 clears the entire lo-res screen and sets 40 x 48 graphics mode. Having selected an initial (x,y) starting point, we can use the module shown in Listing 2 to plot the eight symmetry points. This module (MIRROR) contains two ENTRYs: MIRROR and FATMIRROR.

Subroutine MIRROR plots each of the eight symmetry

FIGURE 2



LISTING 1

```
1                       REL
2                       ORG         $1000
3   *
4                       ENTRY       GR48
5   *
6   * CLEAR THE ENTIRE LO-RES
7   * SCREEN TO A SPECIFIED COLOR,
8   * AND SET 40X48 GRAPHICS MODE.
9   *
10  COLOR               DFB         $00
11  *
12  GR48                STX         SAVEX
13                      LDX         #$77
14                      LDA         COLOR
15  LOOP                STA         $0400,X
16                      STA         $0480,X
17                      STA         $0500,X
18                      STA         $0580,X
19                      STA         $0600,X
20                      STA         $0680,X
21                      STA         $0700,X
22                      STA         $0780,X
23                      DEX
24                      BPL         LOOP
25                      STA         $C050
26                      STA         $C052
27                      STA         $C054
28                      STA         $C056
29                      LDX         SAVEX
30                      RTS
31  *
32  SAVEX               DS          1
33  *
```

TABLE 1

Module:GR48 **Length: $0035**
ENTRYs: GR48
EXTRNs: none
Description:
GR48 clears the entire lo-res screen to a specified color, and sets 40x48 graphics mode.

Enter with:
GR48-1: The color to which the entire lo-res screen is to be set:

- $00: Black
- $11: Magenta
- $22: Dark Blue
- $33: Purple
- $44: Dark Green
- $55: Grey 1
- $66: Medium Blue
- $77: Light Blue
- $88: Brown
- $99: Orange
- $AA: Grey 2
- $BB: Pink
- $CC: Light Green
- $DD: Yellow
- $EE: Aquamarine
- $FF: White

The default value for this parameter is $00 (Black).

Return with:
Lo-res graphics screen: set to 40x48 (full-screen)
X-Register: unmodified
Y-Register: unmodified

points as a single lo-res pixel, while subroutine FATMIROR plots each symmetry point as a solid 3 x 3 rectangle (i.e., a "fat" pixel). The module assumes that both the x and y coordinates can range from 0-47, even though the lo-res screen has only 40 plottable x positions. Therefore x coordinates less than 4 or greater than 43 are simply regarded as being off the screen. Next, we must move from our current (x,y) position to one of its eight nearest neighbors. Which neighbor should we choose?

There are many ways of selecting a neighboring point. For example, we might simply choose one of the eight neighbors at random. Or we might choose to randomly increment or decrement x, while at the same time randomly incrementing or decrementing y. (This latter approach will always select one of the four diagonal neighbors.)

The module shown in Listing 3 (and documented in Table 3), implements yet another selection scheme. The method used by this MOVEXY module generates a smoother path than would result from merely selecting a neighbor purely at random. The module requires the use of a random number generator. The module (RANDOM) for generating random numbers is shown in Listing 4, and is documented in Table 4.

By using the four modules shown in Listings 1 through 4 we could now easily write a lo-res kaleidoscope program. However, such a program would suffer from one serious flaw: The entire lo-res screen would soon become completely filled with dots! To solve this problem, we need to provide a mechanism for erasing some of the old pixels as the new ones are being plotted. This is easily accomplished by the use of a queue. The smaller the queue, the less time each pixel will remain on the screen before it gets erased.

We are now ready to look at the module shown in Listing 5 and documented in Table 5. This module automatically invokes the modules shown in Listings 1 through 4, along with the previously published COLORMAP module, and uses a queue to keep the screen from becoming too cluttered. By using this module, a main program for generating lo-res kaleidoscopes could consist of little more than:

```
        JSR     KALINIT
LOOP    JSR     KALSCOPE
        JMP     LOOP
```

However, a slightly more interesting program is shown in Listing 6. This program is similiar to the three-line example shown above, except pressing any key will stop the kaleidoscope motion. (Color cycling will continue to occur.) Pressing any key again will erase the screen and start a new kaleidoscope.

Things To Try On Your Own:

The module shown in Listing 5 (and Table 5) contains several calling parameters. You might want to modify the program shown in Listing 6 to see how changing these different parameters affects the kaleidoscope. The MIRROR module simulates mirrors meeting at a 45 degree angle and, therefore, plots eight symmetry points.

You might want to try investigating the kinds of kaleidoscopes that result when less than all eight of these symmetry points are plotted. The MOVEXY module (Listing 3 and Table 3) is capable of selecting neighboring pixels from a screen as large as 255 x 255. Therefore you might want to try using it to generate hi–res (or double hi–res) kaleidoscopes.

As was previously mentioned, there are many ways of moving from the current (x,y) to one of its nearest neighbors. You might want to try to write your own "MOVEXY" module that uses a different scheme than the one presented here.

Another fun project would be to create a "kaleido-sketch" program. Such a program would use the game paddles to select the new (x,y) coordinates, and use either subroutine MIRROR or FATMIROR to plot the symmetry points.

The number of different images a kaleidoscope can generate seems almost endless, the same is true concerning the number of different programs possible.

Please rate this article on the Reader Service Card by circling:

71 Excellent **72** Good **73** Fair **74** Poor

LISTING 2

```
1                       REL
2                       ORG     $1000
3   *
4                       ENTRY   MIRROR
5                       ENTRY   FATMIROR
6   *
7   PLOT                EQU     $F800
8   PLOT1               EQU     $F80E
9   *
10  * PLOT A SINGLE DOT (IN THE
11  * CURRENT LO-RES COLOR) AT
12  * XX,YY, ALONG WITH ITS SEVEN
13  * REFLECTIONS. (BOTH XX AND
14  * YY RANGE FROM 0-47.)
15  *
16  YY                  DS      1
17  XX                  DS      1
18  *
19  MIRROR              JSR     MIRROR4
20  MIRROR4             STY     SAVEY
21                      LDY     XX
22                      DEY
23                      DEY
24                      DEY
25                      DEY
26                      CPY     #40
27                      BCS     OFFSCRN
28                      LDA     YY
29                      CMP     #48
30                      BCS     OFFSCRN
31                      STY     XMINUS4
32                      JSR     PLOT
33                      SEC
34                      LDA     #39
35                      SBC     XMINUS4
36                      TAY
37                      JSR     PLOT1
38  *
39                      SEC
40                      LDA     #47
41                      SBC     YY
42                      JSR     PLOT
43                      LDY     XMINUS4
44                      JSR     PLOT1
45  *
46  OFFSCRN             LDA     YY
47                      LDY     XX
48                      STY     YY
49                      STA     XX
50                      LDY     SAVEY
51                      RTS
```

```
51                          RTS
52  *
53  * PLOT A "FAT DOT" (3X3 PIXELS
54  * IN THE CURRENT LO-RES COLOR)
55  * CENTERED AT XX,YY, ALONG WITH
56  * ITS SEVEN REFLECTIONS. (BOTH
57  * XX AND YY RANGE FROM 0-47.)
58  *
59  FATMIROR        DEC     XX
60                  DEC     YY
61                  JSR     MIRROR
62                  INC     XX
63                  JSR     MIRROR
64                  INC     XX
65                  JSR     MIRROR
66                  INC     YY
67                  JSR     MIRROR
68                  INC     YY
69                  JSR     MIRROR
70                  DEC     XX
71                  JSR     MIRROR
72                  DEC     XX
73                  JSR     MIRROR
74                  DEC     YY
75                  JSR     MIRROR
76                  INC     XX
77                  JMP     MIRROR
78  *
79  SAVEY           DS      1
80  XMINUS4         DS      1
81  *
```

TABLE 2

Module: MIRROR **Length: $0084**

ENTRYs: MIRROR, FATMIROR

EXTRNs: none

Description of MIRROR:

Plots a single dot, along with its seven reflections, in the current lo-res color.

Enter MIRROR with:

MIRROR-1: The x coordinate of the dot. (Range: 0-47)
MIRROR-2: The y coordinate of the dot. (Range: 0-47)

Description of FATMIROR:

Plots a "fat dot" (3x3 pixels), along with its 7 reflections, in the current lo-res color.

Enter FATMIROR with:

MIRROR-1: The x coordinate of the center pixel of the fat dot. (Range: 0-47)
MIRROR-2: The y coordinate of the center pixel of the fat dot. (Range: 0-47)

Return from both MIRROR and FATMIROR with:

X-Register: unmodified
Y-Register: unmodified

Discussion:

Even though the lo-res graphics screen is only 40x48 pixels, the kaleidoscope modules work on a square grid of 48x48 pixels. The center of this grid corresponds to the center of the lo-res screen. Therefore, only those pixels whose x coordinates lie in the range 4-43 will actually appear on the lo-res screen.

LISTING 3

```
1                   REL
2                   ORG     $1000
3   *
4                   ENTRY   MOVEXY
5                   EXTRN   RANDOM
6   *
7   * MOVE FROM XX,YY TO ONE OF ITS
8   * EIGHT NEAREST NEIGHBORS. BOTH
9   * XX AND YY RANGE FROM 0 THROUGH
10  * SIZE-1. IF THE NEW XX,YY IS
11  * OUT OF THIS RANGE, BOTH XX AND
12  * YY ARE SET EQUAL TO SIZE/2.
13  * MEANDER SPECIFIES HOW STRAIGHT
14  * THE PATH OF MOTION SHOULD BE.
15  * (THE HIGHER THE VALUE, THE
16  * STRAIGHTER THE PATH.)
17  *
18  MEANDER         DFB     16
19  SIZE            DFB     48
20  YY              DFB     24
21  XX              DFB     24
22  *
23  MOVEXY          STX     SAVEX
24                  LDA     INDEX
25                  LSR     A
26                  LSR     A
27                  TAX
28                  CLC
29                  LDA     XX
30                  ADC     DELTAX,X
31                  BMI     OVERFLOW
32                  CMP     SIZE
33                  BCS     OVERFLOW
34                  STA     XX
35                  CLC
36                  LDA     YY
37                  ADC     DELTAY,X
38                  BMI     OVERFLOW
39                  CMP     SIZE
40                  BCC     ONSCREEN
41  OVERFLOW        LDA     SIZE
42                  LSR     A
43                  STA     XX
44  ONSCREEN        STA     YY
45  *
46                  JSR     RANDOM
47                  CMP     MEANDER
48                  BCS     OK
49                  LDA     MODE
50                  EOR     #$FE
51                  STA     MODE
52  OK              CLC
53                  LDA     INDEX
54                  ADC     MODE
55                  AND     #$1F
56                  STA     INDEX
57                  LDX     SAVEX
58                  RTS
59  *
60  DELTAX          DFB     $01,$01
61  DELTAY          DFB     $01,$00
62                  DFB     $FF,$FF,$FF,$00
63                  DFB     $01,$01
64  INDEX           DFB     0
65  MODE            DFB     $01
66  SAVEX           DS      1
67  *
```

TABLE 3

Module: MOVEXY **Length: $0063**
ENTRYs: MOVEXY
EXTRNs: RANDOM

Description:

Given a current x,y coordinate on a grid, choose one of its eight nearest neighbors to be the new x,y. If the selected neighbor lies off of the grid, the center of the grid is chosen as the new x,y.

Enter with:

MOVEXY-1: The current x coordinate (Default: 24)
MOVEXY-2: The current y coordinate (Default: 24)
MOVEXY-3: The size of the grid (i.e., one more than the maximum value that either the x or y coordinate can attain. Default: 48)
MOVEXY-4: Specifying how much the path will meander. The higher the value, the straighter the path. (Range: 0-255, Default: 16)

Return with:

MOVEXY-1: The new x coordinate
MOVEXY-2: The new y coordinate
X-Register: unmodified
Y-Register: unmodified

LISTING 4

```
 1                      REL
 2                      ORG     $1000
 3  *
 4                      ENTRY   RANDOM
 5  *
 6  * GENERATE A RANDOM NUMBER IN
 7  * THE RANGE 0 TO 255.  RETURN
 8  * IT IN THE A-REG.
 9  *
10  SEED                DW      $0001
11  *
12  RANDOM              CLC
13                      LDA     SEED+0
14                      STA     WORK+0
15                      ADC     SEED+1
16                      STA     WORK+1
17                      ASL     SEED+0
18                      ROL     SEED+1
19                      CLC
20                      LDA     WORK+0
21                      ADC     SEED+0
22                      STA     SEED+0
23                      LDA     WORK+1
24                      ADC     SEED+1
25                      STA     SEED+1
26                      RTS
27  *
28  WORK                DS      2
29  *
```

TABLE 4

Module: RANDOM **Length: $002B**
ENTRYs: RANDOM
EXTRNs: none

Description:

Generates a random number in the range 0-255.

Enter with:

RANDOM-2: A two-byte "seed". (Default: $0001)

Return with:

A-register: Containing the random number
X-Register: unmodified
Y-Register: unmodified

LISTING 5

```
 1                      REL
 2                      ORG     $1000
 3  *
 4                      ENTRY   KALINIT
 5                      ENTRY   KALSCOPE
 6                      ENTRY   COLRCYCL
 7                      EXTRN   GR48
 8                      EXTRN   CMINIT
 9                      EXTRN   MIRROR
10                      EXTRN   FATMIROR
11                      EXTRN   COLORMAP
12                      EXTRN   MOVEXY
13  *
14  COLOR               EQU     $30
15  DELAY               EQU     $FCA8
16  *
17  * INITIALIZE THE KALEIDOSCOPE.
18  *
19  * 'MAP' IS A 2-BYTE POINTER TO
20  * THE COLOR TABLE TO BE USED.
21  * 'QSIZE' IS THE SIZE OF THE
22  * QUE TO BE USED (RANGE: 0-255).
23  * IF A SIZE OF 0 IS SPECIFIED,
24  * THE QUE WILL BE 256 BYTES.
25  *
26  MAP                 DW      COLRTABL
27  QSIZE               DFB     $20
28  *
29  KALINIT             STX     SAVEX
30                      LDX     #0
31                      STX     QINDEX
32                      LDA     #$FF
33  INITLOOP            STA     XQ,X
34                      STA     YQ,X
35                      INX
36                      CPX     QSIZE
37                      BNE     INITLOOP
38                      LDA     MAP+0
39                      STA     CMINIT-2
40                      LDA     MAP+1
41                      STA     CMINIT-1
42                      JSR     CMINIT
43                      LDX     SAVEX
44                      JMP     GR48
45  *
46  * INCREMENT THE KALEIDOSCOPE.
47  *
48  * 'SPEED' (RANGE: 0-255) SPECI-
49  * FIES HOW FAST THE KALEIDOSCOPE
50  * WILL MOVE (255=FASTEST).
51  *
52  SPEED               DFB     128
53  *
54  KALSCOPE            STX     SAVEX
55                      LDX     QINDEX
56                      LDA     XQ,X
57                      BMI     STEPXY
58                      STA     MIRROR-1
59                      LDA     YQ,X
60                      STA     MIRROR-2
61                      LDA     #$00
```

```
                        STA     COLOR
                        JSR     FATMIROR
STEPXY                  JSR     MOVEXY
                        LDA     MOVEXY-1
                        STA     XQ,X
                        STA     MIRROR-1
                        LDA     MOVEXY-2
                        STA     YQ,X
                        STA     MIRROR-2
                        LDA     #$FF
                        STA     COLOR
                        JSR     FATMIROR
                        INX
                        CPX     QSIZE
                        BNE     DONE
                        LDX     #0
DONE                    STX     QINDEX
                        LDX     SAVEX
                        JMP     CYCLE
*
* COLORMAP THE CURRENT KALEIDO-
* SCOPE INTO ITS NEXT SET OF
* COLORS.  (AGAIN, 'SPEED' DE-
* TERMINES THE RATE OF MOTION.)
*
COLRCYCL                LDA     #$40
                        JSR     DELAY
CYCLE                   JSR     COLORMAP
                        SEC
                        LDA     #0
                        SBC     SPEED
                        JMP     DELAY
*
* DEFAULT COLOR TABLE:
*  WHITE --> LIGHT BLUE
*  LIGHT BLUE --> BLUE
*  BLUE --> PURPLE
*  PURPLE --> MAGENTA
*  MAGENTA --> ORANGE
*  ORANGE --> YELLOW
*  YELLOW --> GREEN
*  GREEN --> BLUE
*
COLRTABL                DFB     0,3,0,6,0,0
                        DFB     12,6,0,1,0
                        DFB     0,13,9,0,7
*
SAVEX                   DS      1
QINDEX                  DS      1
XQ                      DS      256
YQ                      DS      256
*
```

TABLE 5

Module: KALSCOPE **Length: $029A**

ENTRYs: KALINIT, KALSCOPE, COLORCYCL

EXTRNs: GR48, CMINIT, MIRROR, FATMIROR, COLORMAP, MOVEXY

Description of KALINIT:

Initializes the kaleidoscope.

Enter KALINIT with:

KALINIT-1: The size of the queue. (Default: $20)

KALINIT-3: A two-byte pointer to the color table to be used for color mapping. The default for this parameter points to a color table which maps:

White --> Light Blue
Light Blue --> Blue
Blue --> Purple
Purple --> Magenta
Magenta --> Orange
Orange --> Yellow
Yellow --> Green
Green --> Blue

Return from KALINIT with:

Lo-Res screen: turned on & cleared
X-Register: unmodified
Y-Register: unmodified

Description of KALSCOPE:

Increments the kaleidoscope.

Enter KALSCOPE with:

KALSCOPE-1: The speed at which the kaleidoscope will run. (0 = slowest, 255 = fastest, Default: 128)

Return from KALSCOPE with:

X-Register: unmodified
Y-Register: unmodified

Description of COLRCYCL:

Uses the COLORMAP module to change each pixel of the current kaleidoscope into its next color.

Enter COLRCYCL with:

KALSCOPE-1: The speed at which the kaleidoscope will run. (0 = slowest, 255 = fastest, Default: 128)

Return from COLRCYCL with:

X-Register: unmodified
Y-Register: unmodified

LISTING 6

```
                        REL
                        ORG     $1000
*
                        EXTRN   KALINIT
                        EXTRN   KALSCOPE
                        EXTRN   COLRCYCL
*
*
*
* KALEIDOSCOPE PROGRAM
*
*
*
READKEY         EQU     $C000
CLEARKEY        EQU     $C010
*
START                   JSR     KALINIT
                        STA     CLEARKEY
RUNNING                 JSR     KALSCOPE
                        BIT     READKEY
                        BPL     RUNNING
                        STA     CLEARKEY
FROZEN                  JSR     COLRCYCL
                        BIT     READKEY
                        BPL     FROZEN
                        JMP     START
*
```

Anatomy of the IIGS System Disk

Ken Kashmarek

One of the key components of your Apple IIGS system is the ProDOS 16 System Disk. Without this disk, many aspects of the IIGS are not functional. However, very little documentation about the IIGS system disk is provided. This is not surprising since the layout is probably not yet complete and subject to change.

There are a number of things that Apple Computer has not told users about the system disk. For example, the system disk must be booted to insure correct operation of the IIGS tools. The program Launcher is a ProDOS 16 application and can only be brought up after the system disk has been booted. To learn more about the Apple IIGS system disk, we will go directly to the disk layout.

Apple IIGS System Disk Layout and Organization

Very little information is given to indicate what happens when the system disk is booted. While the new ProDOS 16 program Launcher makes it easy to start applications, no explanation is given as to how the Launcher is started. To use the system disk, you must have a 3.5" drive (Apple 3.5 or UniDisk 3.5) connected to the Smartport disk connector. Insert the disk labeled Apple IIGS System Disk (/SYSTEM.DISK) into the drive, and power on your machine. The program Launcher is started after all ProDOS 16 program files and IIGS tool files are loaded. The system disk supports the IIGS running ProDOS 8 and ProDOS 16 Version 1.1. ProDOS 8 is also know as ProDOS V1.3. The current disk is dated 02 December 1986. First of all, the disk layout, is given in Table 1 (detailed listing is given in Table 2).

The boot blocks have not changed from ProDOS 1.1.1. Blocks 0 and 1 initiate the boot sequence, and search the volume root directory for a file named PRODOS. However, this file is not the ProDOS operating system kernel. It is a new system initialization file that determines the environment and initializes the IIGS world. This file uses the SYSTEM directory for the remainder of the boot process. ProDOS 16 is loaded from the SYSTEM directory. The ProDOS 16 operating system kernel is contained in file P16.

Remember, the IIGS can operate in two modes: native 16 bit mode and emulation 8 bit mode. ProDOS 16 runs in native 16 bit mode while ProDOS 8 runs in emulation 8 bit mode (as does older versions of ProDOS, PASCAL, and DOS 3.3). In native mode, all of the capabilities of the IIGS are available to an application and the user. In emulation mode, an application is essentially limited to memory banks 0 and 1 (128K).

The SYSTEM Directory

This directory contains file P8, which is ProDOS 8 (ProDOS Version 1.3, file type SYS; other file types are shown in Table 5). P8 provides IIGS clock support, recognition of the SmartPort (slot 5 intelligent disk controller), /RAM5

support using the IIGS extended memory card, and enabled interrupts for access to the IIGS Control Panel. The P8 ProDOS kernel will also run on the IIc and IIe, and still recognizes Thunderclock and Smartport devices. In order to use this file on other computers, it must be copied to the root directory of a diskette and renamed ProDOS. P8 only supports I/O to the first bank of memory on the IIGS.

File P16 is the ProDOS 16 file (Version 1.1, file type $F9). P16 is loaded by the ProDOS initialization file. It must be available to establish the full native 16 bit environment. P16 will perform I/O to any bank of memory in the system. If P16 is not found, the system will not boot.

File P8 is used when you switch, via the Launcher or QUIT code, to a ProDOS 8 application. When you QUIT a ProDOS 8 application and go to a ProDOS 16 application, file P16 is once again loaded (more on the QUIT code later).

File START is the program Launcher (ProDOS 16 file type $B3, or S16). Launcher is one of two native ProDOS 16 applications on the system disk (the other is DESKTOP.SYS16). START is loaded and executed after the boot initialization program has loaded all ProDOS 16 files and established the native ProDOS 16 environment.

The SYSTEM.SETUP directory contains the setup files (ProDOS 16 file type $B6 or STR). File TOOL.SETUP provides the RAM based tool fixes and extensions for ROM tools (yes, there are several). This file *must* be loaded for correct operation of many ROM tools. This file is loaded *only* via a ProDOS 16 boot. In other words, correct use of the ROM tools requires a native ProDOS 16 boot on the IIGS. Any application using IIGS tools, whether 8 or 16 bit, requires a ProDOS 16 boot of the IIGS. This directory also contains setup code needed by AppleTalk.

The TOOLS directory contains the RAM based tools. These are loaded as needed by applications. For example, Launcher loads most of the RAM based tools, but they are removed from memory when no longer needed. The TOOL file type is TOL, or $BA. The file name is important. It must be of the form TOOLnnn where nnn is the decimal tool number (TOOL015 for tool fifteen).

DESK.ACCS contains the classic desk accessories (file type $B9 or CDA) and the new desk accessories (file type $B8 or NDA). These are loaded at ProDOS 16 boot time. This directory is

TABLE 1
System Disk Layout

Volume/directory/filename	Clue that Apple Computer forgot
/SYSTEM.DISK/	Volume Directory Name
PRODOS	System Disk initialization file
SYSTEM/	System initialization directory
P8	ProDOS 8 Kernel (v1.3)
P16	ProDOS 16 Kernel (v1.1)
START	Program Launcher (16 bit)
SYSTEM.SETUP/	Boot Setup Directory
TOOL.SETUP	Firmware Tool setup file
ATINIT	AppleTalk programs
ATLOAD.0	AppleTalk initialization
TOOLS/	RAM based Tools directory
TOOL014	Window Manager
TOOL015	Menu Manager
TOOL016	Control Manager
TOOL020	Line Edit
TOOL021	Dialog Manager
TOOL022	Scrap Manager
TOOL023	Standard Files Tool
TOOL025	Note Synthesizer
TOOL027	Font Manager
TOOL028	Unknown
DESK.ACCS/	Desk Accessories (empty)
DRIVERS/	Device drivers (empty)
FONTS/	Graphic fonts
COURIER	10 & 12 pitch
GENEVA	10 & 12 pitch
HELVETICA	10 & 12 pitch
TIMES	10 & 12 pitch
VENICE	14 pitch
DESKTOP.SYS16	Desktop initialization(16 bit)
DESKTOP/	Desktop directory
SELECTOR	Program selector (8 bit)
DESKTOP1	Finder system file (8 bit)
DESKTOP2	Finder program file (8 bit)
SELECTOR.LIST	Run List
DESK.ACC/	Accessories directory
CALCULATOR	Desk calculator
DATE	Display date/time
PUZZLE	A toy
SHOW.TEXT.FILE	Display text files
SORT.DIRECTORY	Directory sort
APPLETALK/	AppleTalk directory
CHOOSER.II	Chooser system file
CHOOSER.0	Chooser program file
NAMER.II	Namer system file
NAMER.0	Namer program file
MTXABS.0	MouseText program file
IWEM	ImageWriter emulator
SYS.UTILS/	System Utilities
SYSUTIL.SYSTEM	SYSUTIL system file
GSSU0	Bank 0 code
GSSU1	Bank 1 code (?)
GSSUE1	Bank E1 code
BASIC.SYSTEM	Old faithful
BASIC.LAUNCHER	Invokes Applesoft directly

TABLE 2
System Disk Directory Listing (V1.1)

/SYSTEM.DISK/

NAME	TYPE	BLOCKS	MODIFIED		CREATED		ENDFILE
PRODOS	SYS	42	2-DEC-86	12:00	2-DEC-86	12:00	20992
SYSTEM	DIR	1	2-DEC-86	12:00	2-DEC-86	12:00	512
DESKTOP.SYS16	$B3	1	26-NOV-86	12:00	26-NOV-86	12:00	274
DESKTOP	DIR	1	2-DEC-86	12:00	2-DEC-86	12:00	512
APPLETALK	DIR	1	2-DEC-86	12:00	2-DEC-86	12:00	512
SYS.UTILS	DIR	1	2-DEC-86	12:00	2-DEC-86	12:00	512
BASIC.SYSTEM	SYS	21	18-JUN-84	0:00	2-DEC-86	11:06	10240
BASIC.LAUNCHER	SYS	3	2-DEC-86	12:00	2-DEC-86	12:00	714

/SYSTEM.DISK/SYSTEM/

NAME	TYPE	BLOCKS	MODIFIED		CREATED		ENDFILE
P8	SYS	32	2-DEC-86	12:00	2-DEC-86	12:00	15485

empty. A CDA is accessed from the Control Panel menu which is activated using Control Open-Apple Escape. An NDA is accessed from a menu or dialog screen when system loaded NDAs are supported by the application (Application must use the FIXAPPLEMENU call).

The DRIVERS directory will hold device drivers (currently empty). The FONTS directory holds several QuickDraw II fonts.

Launcher (filename SYSTEM/START)

The program Launcher is used to invoke ProDOS 8 and ProDOS 16 applications. Launcher requires the mouse for correction operation. However, you may also use the following undocumented keys to substitute for clicking on screen icons:

Disk	Tab key
Open	Return key
Close	Escape key
Quit	Open-Apple (period)
selection	use arrow keys or alpha key

You may use the arrow keys for selection and then hit RETURN to open a directory or launch a program. To move quickly down the selection list, which is presented in alphabetic order (not the order in the directory itself), hit any alphabetic key. To move to the first entry beginning with 'D', hit the D key.

START may be renamed or replaced in the SYSTEM directory. If it is simply renamed, then the boot process will continue by looking in the root directory for the first filename ending with '.SYS16' (this file must also have file type S16). Without any other changes to the system disk, the boot process would then find DESKTOP.SYS16, and come up with the IIGS version of Mouse Desk. If a '.SYS16' file is not found, the boot process proceeds to look for a '.SYSTEM' file (file type SYS). If BASIC.SYSTEM is in the root directory, the boot process will then switch to ProDOS 8, and bring up BASIC.SYSTEM.

If START is replaced with another application, the file must be file type S16 and must be named START. It will be loaded and executed in native 16 bit mode.

When START or any other S16 file is executed during the boot process, ProDOS 16 is active and the ProDOS 16 QUIT code is in place. The new QUIT code is responsible for switching be-

P16	$F9	73	2-DEC-86	12:00	2-DEC-86	12:00	36436
START	$B3	8	2-DEC-86	12:00	2-DEC-86	12:00	3459
SYSTEM.SETUP	DIR	1	2-DEC-86	12:00	2-DEC-86	12:00	512
TOOLS	DIR	1	2-DEC-86	12:00	2-DEC-86	12:00	512
DESK.ACCS	DIR	1	2-DEC-86	12:00	2-DEC-86	12:00	512
DRIVERS	DIR	1	2-DEC-86	12:00	2-DEC-86	12:00	512
FONTS	DIR	1	2-DEC-86	12:00	2-DEC-86	12:00	512

/SYSTEM.DISK/DESKTOP/

NAME	TYPE	BLOCKS	MODIFIED		CREATED		ENDFILE
SELECTOR	$F1	79	26-NOV-86	12:00	26-NOV-86	12:00	39776
DESKTOP1	SYS	17	26-NOV-86	12:00	26-NOV-86	12:00	8192
DESKTOP2	$F1	224	26-NOV-86	12:00	26-NOV-86	12:00	113888
SELECTOR.LIST	$F	5	26-NOV-86	12:00	26-NOV-86	12:00	2048
DESK.ACC	DIR	1	2-DEC-86	12:00	2-DEC-86	12:00	512

/SYSTEM.DISK/APPLETALK/

NAME	TYPE	BLOCKS	MODIFIED		CREATED		ENDFILE
CHOOSER.II	SYS	3	2-DEC-86	12:00	2-DEC-86	12:00	761
CHOOSER.0	BIN	66	2-DEC-86	12:00	2-DEC-86	12:00	32956
NAMER.II	SYS	3	2-DEC-86	12:00	2-DEC-86	12:00	738
NAMER.0	BIN	55	2-DEC-86	12:00	2-DEC-86	12:00	27368
MTXABS.0	BIN	31	2-DEC-86	12:00	2-DEC-86	12:00	15322
IWEM	TXT	95	2-DEC-86	12:00	2-DEC-86	12:00	47713

/SYSTEM.DISK/SYS.UTILS/

NAME	TYPE	BLOCKS	MODIFIED		CREATED		ENDFILE
SYSUTIL.SYSTEM	SYS	3	10-NOV-86	12:00	10-NOV-86	12:00	763
GSSU0	BIN	48	10-NOV-86	12:00	10-NOV-86	12:00	23600
GSSU1	BIN	62	10-NOV-86	12:00	10-NOV-86	12:00	31152
GSSUE1	BIN	28	10-NOV-86	12:00	10-NOV-86	12:00	13412

/SYSTEM.DISK/SYSTEM/SYSTEM.SETUP/

NAME	TYPE	BLOCKS	MODIFIED		CREATED		ENDFILE
TOOL.SETUP	$B6	52	2-DEC-86	12:00	2-DEC-86	12:00	25748
ATINIT	$E2	16	2-DEC-86	12:00	2-DEC-86	12:00	7459
ATLOAD.0	$B6	1	2-DEC-86	12:00	2-DEC-86	12:00	308

8/SYSTEM.DISK/SYSTEM/TOOLS/

NAME	TYPE	BLOCKS	MODIFIED		CREATED		ENDFILE
TOOL014	$BA	37	2-DEC-86	12:00	2-DEC-86	12:00	18318
TOOL015	$BA	21	2-DEC-86	12:00	2-DEC-86	12:00	9889
TOOL016	$BA	22	2-DEC-86	12:00	2-DEC-86	12:00	10352
TOOL020	$BA	13	6-SEP-86	12:00	6-SEP-86	12:00	5957
TOOL021	$BA	28	2-DEC-86	12:00	2-DEC-86	12:00	13652
TOOL022	$BA	9	2-DEC-86	12:00	2-DEC-86	12:00	3947
TOOL023	$BA	32	2-DEC-86	12:00	2-DEC-86	12:00	15444
TOOL025	$BA	12	20-OCT-86	12:00	20-OCT-86	12:00	5607
TOOL027	$BA	22	2-DEC-86	12:00	2-DEC-86	12:00	10428
TOOL028	$BA	9	2-DEC-86	12:00	2-DEC-86	12:00	3784/

/SYSTEM.DISK/SYSTEM/DESK.ACC
/SYSTEM.DISK/SYSTEM/DRIVERS
/SYSTEM.DISK/SYSTEM/FONTS/

NAME	TYPE	BLOCKS	MODIFIED		CREATED		ENDFILE
COURIER.10	$C8	6	2-DEC-86	12:00	2-DEC-86	12:00	2482
COURIER.12	$C8	7	2-DEC-86	12:00	2-DEC-86	12:00	2802
GENEVA.10	$C8	6	2-DEC-86	12:00	2-DEC-86	12:00	2221
GENEVA.12	$C8	7	2-DEC-86	12:00	2-DEC-86	12:00	2755
HELVETICA.10	$C8	6	2-DEC-86	12:00	2-DEC-86	12:00	2418
HELVETICA.12	$C8	7	2-DEC-86	12:00	2-DEC-86	12:00	3000
TIMES.10	$C8	6	2-DEC-86	12:00	2-DEC-86	12:00	2414
TIMES.12	$C8	7	2-DEC-86	12:00	2-DEC-86	12:00	2824
VENICE.14	$C8	9	2-DEC-86	12:00	2-DEC-86	12:00	3625

/SYSTEM.DISK/DESKTOP/DESK.ACC/

NAME	TYPE	BLOCKS	MODIFIED		CREATED		ENDFILE
CALCULATOR	$F1	7	26-NOV-86	12:00	26-NOV-86	12:00	3044
DATE	$F1	5	26-NOV-86	12:00	26-NOV-86	12:00	1837
PUZZLE	$F1	7	26-NOV-86	12:00	26-NOV-86	12:00	2806
SHOW.TEXT.FILE	$F1	7	26-NOV-86	12:00	26-NOV-86	12:00	2799
SORT.DIRECTORY	$F1	4	26-NOV-86	12:00	26-NOV-86	12:00	1389
BLOCKS FREE:	319	BLOCKS USED: 1281			TOTAL BLOCKS: 1600		

TABLE 3
5.25" System Disk Layout

/SYSTEM.DISK/

NAME	TYPE	BLOCKS	MODIFIED		CREATED		ENDFILE
PRODOS	SYS	42	2-DEC-86	12:00	26-JAN-87	18:20	20992
*SYSTEM	DIR	1	26-JAN-87	18:25	26-JAN-87	18:21	512
BASIC.SYSTEM	SYS	21	18-JUN-84	0:00	26-JAN-87	19:02	10240

/SYSTEM.DISK/SYSTEM/

NAME	TYPE	BLOCKS	MODIFIED		CREATED		ENDFILE
P8	SYS	32	2-DEC-86	12:00	26-JAN-87	18:21	15485
P16	$F9	73	2-DEC-86	12:00	26-JAN-87	18:22	36436
*SYSTEM.SETUP	DIR	1	26-JAN-87	18:25	26-JAN-87	18:24	512

/SYSTEM.DISK/SYSTEM/SYSTEM.SETUP/

NAME	TYPE	BLOCKS	MODIFIED		CREATED		ENDFILE
TOOL.SETUP	$B6	52	2-DEC-86	12:00	26-JAN-87	18:25	25748

BLOCKS FREE: 51 BLOCKS USED: 229 TOTAL BLOCKS: 280

tween ProDOS 16 and ProDOS 8 when an application is invoked. If QUIT is invoked from any application established by the Launcher, it will return to the Launcher, even if that application is ProDOS 8 based. The switching process is very fast since ProDOS 16, the Launcher, and the QUIT code stay in memory when ProDOS 8 is invoked from the Launcher. Use the BYE command from BASIC.SYSTEM to quit back to the Launcher. The new QUIT function is not available if the IIGS has been booted into a non-ProDOS 16 environment.

Booting the system disk takes a long time when Launcher is the START file. Launcher uses QuickDraw II, and most of the RAM based TOOL files in the TOOLS directory. Launcher uses almost 150K of memory when everything is in place (of which 32K is the new super hires screen area). It is not necessary to copy DESKTOP or any other '.SYS16' file to the SYSTEM directory in order to change the startup program. Simply rename START to something else, and the boot process will find the first '.SYS16' file in the root directory (or '.SYSTEM' file) to be used as a start program.

In the initial system documentation, there is some confusion about which program is the Finder. It turns out that Launcher is actually the Finder. However, all the Finder functions were not ready in time, and DESKTOP was installed on the disk to provide this capability. Some day in the future, we will have a full function Finder capability in the Launcher program, and DESKTOP will be gone (keep your old copies if you like it, but it won't run on a IIc or IIe).

DESKTOP

DESKTOP.SYS16 is a 16 bit application that establishes the environment for DESKTOP. The rest of DESKTOP is a ProDOS 8 based application even though it is invoked through a '.SYS16' file. DESKTOP.SYS16 also serves as a ProDOS 16 QUIT handler. Any application launched through DESKTOP will return to DESKTOP (8 bit or 16 bit applications).

DESKTOP provides two functions: program selector and Mouse Desk. DESKTOP.SYS16 uses the DESKTOP directory and has its own set of desk accessories.

DESKTOP requires significantly less memory than Launcher since it does not use QuickDraw II. However, if you use 16 bit applications, it requires that ProDOS 8 be reloaded each time QUIT is used from a 16 bit application. This also requires that DESKTOP be reloaded since most ProDOS 16 applications will eventually purge the memory segments from the memory areas.

DESKTOP provides a fully functional environment for file handling. It has some quirks and shortcuts. Among the quirks is a routine called SHOW TEXT FILE. In order to use SHOW TEXT FILE, you must completely select a text file via the icon menus (not intuitively obvious). DESKTOP also may be hard on your disk drives. It continuously checks (about once per second) to see if you have changed disks in a drive. This can be observed by watching the select light on a 3.5" drive. It will blink each time it is checked. *Do not* leave DESKTOP unattended. It could shorten the life of your drive.

The DESKTOP Selector has some nice short cuts. When the message "Loading Selector" appears on the screen, you may key the selection number that you want invoked. It will immediately pass control to that routine without putting up any menus. The second selection in my list is BASIC.SYSTEM. Therefore, keying a 2 causes BASIC.SYSTEM to be selected and run. In addition, if you want to boot a disk, keying Open-Apple followed by slot # will cause that disk to be booted. If you enter 'Q' while the "Loading Selector" message is on the screen, DESKTOP will immediately switch to the DESKTOP menu and bypass the selector menu. Unfortunately, when you get to the DESKTOP (not Selector) menu, a digit no longer invokes a selection to run. You must now use Open-Apple followed by the digit (up to 8 applications).

AppleTalk

AppleTalk is supplied to provide support for the laser printer using ImageWriter emulation. Unless you are using a laser printer or have an AppleTalk network connection (for which no code exists), you may safely delete the AppleTalk files from your working copy of the system disk.

System Utilities

The IIGS System Utilities is an advanced version of the original IIc system utilities, and the UniDisk 3.5 system utilities. This version, while still ProDOS 8 based, no longer makes use of AppleSoft BASIC. However, it does make use of the IIGS features, including some tools and the memory areas in the shadow banks (slow video memory). I am not real fond of this package. The documentation is awful or mostly non-existent. It will not run on a IIc or IIe.

The System Utilities makes use of the MouseText and the shadow display pages. Pop-up dialog windows and help windows are displayed in the shadow bank text screen areas. The program text pages are left undisturbed in the main and auxiliary banks. When the pop-up window is cleared, the program simply moves the text pages to themselves which forces the bytes to again be moved to the shadow areas and be re-displayed (shadow memory is used to support video output for all applications).

Basic.System

Old faithful is still around for those of us that live and breathe AppleSoft. In fact, ProDOS 16 can be booted from a 5.25" disk and come up in BASIC .SYSTEM (running ProDOS 8 of course). It is the only application on the system disk that can be transferred to a 5.25"

TABLE 5
ProDOS 16 File Types Prodos 16 file types in use

Hex	Type	Description		
$B0	SRC	Source files, or better known as ProDOS 16 text files.	Subtype	Language
			$0001	TEXT
			$0003	ASM65816
			$0006	EXEC
			$0009	LINKED
			$000A	CC
$B1	OBJ	Object files (object module format)		
$B2	LIB	Library files		
$B3	S16	ProDOS 16 SYS16 system files		
$B4	RTL	Run time library		
$B5	EXE	Shell load file		
$B6	STR	Setup Tool Routines		
$B7		Removable initialization file		
$B8	NDA	New Desk Accessory		
$B9	CDA	Classic Desk Accessory		
$BA	TOL	Tool files		
$C8		Font files		
#E1		Sound file (used by the sound demo)		
$E2	DTS	AppleTalk tool initialization		
$F1		Used in DESKTOP		
#F9		P16, the ProDOS 16 file		

TABLE 4
5.25" ProDOS 16 Only Disk Layout

SYSTEM.DISK/

NAME	TYPE	BLOCKS	MODIFIED		CREATED		ENDFILE
PRODOS	SYS	42	2-DEC-86	12:00	26-JAN-87	18:20	20992
*SYSTEM	DIR	1	26-JAN-87	18:26	26-JAN-87	8:21	512

/SYSTEM.DISK/SYSTEM/

NAME	TYPE	BLOCKS	MODIFIED		CREATED		ENDFILE
P16	$F9	73	2-DEC-86	12:00	26-JAN-87	18:23	36436
*SYSTEM.SETUP	DIR	1	26-JAN-87	18:26	26-JAN-87	18:24	512/

SYSTEM.DISK/SYSTEM/SYSTEM.SETUP/

NAME	TYPE	BLOCKS	MODIFIED		CREATED		ENDFILE
TOOL.SETUP	$B6	52	2-DEC-86	12:00	26-JAN-87	18:25	25748

BLOCKS FREE:: 104 BLOCKS USED : 176 TOTAL BLOCKS: 280

disk and booted. However, the 5.25" disk is very bare. No RAM based tools. No DESKTOP. No Launcher. No AppleTalk. No IIGS System Utilities. And, only 51 free blocks (Table 3).

BASIC.SYSTEM and hooks to AppleSoft only exist in emulation running ProDOS 8. The AppleSoft ROM is unchanged and only runs in emulation mode. ProDOS 8 and emulation mode 8 bit programs can only run in the main and auxiliary banks (reached via softswitches or bank switching, not the bank register). Of course, programs in emulation can change states, and establish a native environment to call 16 bit native tools. All tools require, and expect, the 16 bit native environment when called.

The change of state from 8 bit emulation to 16 bit native is quite exhaustive and may require a new direct page and stack since the default zero page and stack is not large enough for many of the tools. If the tool uses the memory manager and requires space in the main or auxiliary banks, the tool will not work since all of this space is allocated to ProDOS 8. The event manager is not active when ProDOS 8 is running. The event manager is the key tool for using the mouse, and is required for the desk manager, menu manager, and window manager. The mouse may be used without the event manager, but many facilities are then not available, or must be coded in emulation. All RAM based tools are ProDOS 16 loader files, and cannot be loaded by ProDOS 8 (requires the ProDOS 16 loader). A 5.25" diskette may be configured for ProDOS 16 only. In this state, there are 104 free blocks for a ProDOS 16 application (Table 4). This is not much room when you consider that an 8K application will have a 20 to 25 block load module file.

BASIC.LAUNCHER is used when the Launcher directly invokes an AppleSoft BASIC program file. In this situation, the normal BASIC.SYSTEM STARTUP file is not used. Therefore, your AppleSoft program must take greater responsibility for establishing its working environment.

/RAM5

The IIGS supports a memory resident RAM disk, called /RAM5, when configured for this operation from the control panel. The control panel (invoked via Control Open-Apple Escape) allows RAM disk to be dynamically configured. That is, you may establish a minimum number of blocks that is less than the maximum number of blocks (expressed in K units). Don't. This feature does not work correctly. If you configure /RAM5, be sure to set the minimum and maximum blocks to the same value.

ProDOS 16, Linkers, Loaders, and such

To prevent memory conflicts in a ProDOS 16 environment, programs must be relocatable to any memory address upon loading. Therefore, the load modules contain relocation information. Load modules are produced by the linker (or link editor). Load modules are different from object modules, which are produced by compilers and assemblers. Object modules do not have external references resolved.

A compiler takes source files and produces object files. A linker takes object files and libraries to produce load modules. The loader takes load modules and relocates them to an area obtained in memory from the memory manager. The loader also dynamically loads external segments from the run time libraries during program execution. Complicated? Yes. Slow? Sometimes. Powerful? Yes.

To run programs on the IIGS in native mode, a compiler or assembler needs to produce the object files in standard OMF (object module format). The Apple Programmer Workshop (APW) assembler will produce object files. The APW linker will convert the object file to load module format and include external references from a subroutine library. The ProDOS 16 loader will take care of loading the load module into memory and obtain dynamically called external segments (this includes the new direct page and stack segment, as well as the initialization segment). On the IIGS, there is

SALE • *Famous National Brand* • SAVE

NLQ 180
Hi-Speed Printer Sale

• 160 - 180 CPS • Near Letter Quality •
Lifetime Warranty*

Price Break Thru

Sale $199.00 List $499.95 Fantastic Price

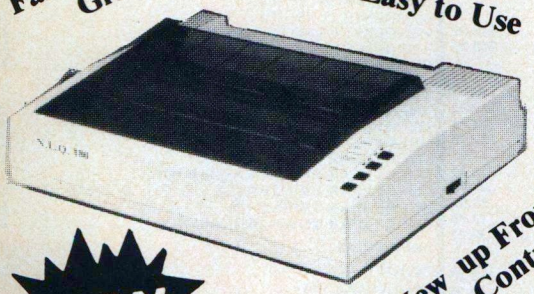
Below Wholesale Cost Prices!!!

60% OFF LIST PRICE

10" Carriage

Fantastic Graphics

Easy to Use



All New up Front Panel Controls

NEW

Lifetime Warranty*

NLQ-180 Premium Quality Printer

Near Letter Quality Selectable From Front Panel Controls • High Speed Dot Matrix• Letter Quality Modes • 8K Buffer frees up computer 4-times faster • Pica, Elite, Italics, Condensed • Super Graphics • Business or Personal • Tractor/Friction • 15 Day Free Trial • Lifetime Warranty on Print Head* • 6 Month Immediate Replacement Warranty •

NLQ-180 Print Samples

This is an example of ITALICS
Enhanced Boldface
Condensed Text Double-strike
example of Near Letter Quality

— IBM — COMMODORE — EPSON — **NLQ180 SPECIFICATIONS** ——— APPLE — ATARI — ETC. ———

***Print* Buffer**
8K bytes utility buffer
Printing Direction
Text Mode — Bi-directional
Graphic Mode — Uni-directional
Interface
Centronics type parallel (8-bit)
Paper
Plain paper, Roll paper, Single sheet
Fanfold, Multipart paper: max. 3 sheets (original plus 2 copies)
Character Fonts
Pica, Elite, Italics, Condensed

Printing Method
Impact dot matrix
Printing Speed
160-180 CPS at standard character printing
Printing Characters
Standard 9 x 9 dot matrix
NLQ 12 x 18 dot matrix (33cps)
Character size: 2.12 x 2.8 mm (standard)
Character sets: Full ASCII character set (96)
32 International characters

Ink Ribbon Cartridge
Ribbon Life: 3 million characters/cartridge
Physical Dimensions
Size: 15" x 12" x 5"
Weight: 12.7 lbs.
Maximum Number of Characters

Standard:	10 cpi	80 cpl
Standard enlarged:	5 cpi	40 cpl
Elite:	12 cpi	96 cpl
Elite enlarged:	6 cpi	48 cpl
Condensed:	17 cpi	132 cpl
Condensed enlarged:	8.5 cpi	66 cpl
Condensed elite:	20 cpi	160 cpl

INTERFACES

Atari $39.95 Apple $49.95 Commodore $29.95 IBM $49.95 Laser $19.95

Add $10.00 for shipping, handling, and insurance. Illinois residents please add 6½% sales tax. Add 20.00 for CANADA, PUERTO RICO, HAWAII, ALASKA, APO-FPO orders. All orders must be in U.S. Dollars. WE DO NOT EXPORT TO OTHER COUNTRIES EXCEPT CANADA. Enclose Cashier Check, Money Order or Personal Check. Allow 14 days for delivery, 2 to 7 days for phone orders, 1 day express mail. Prices & Availability subject to change without notice.

VISA — MASTER CARD — C.O.D. C.O.D. on phone orders only.

COMPUTER DIRECT

We Love Our Customers

22292 N. Pepper Rd., Barrington, Ill. 60010

312/382-5050 to order

CIRCLE 13 ON READER SERVICE CARD

SALE SUPER VALUES COMPUTER DIRECT SAVE

SINGLE SIDED/DOUBLE DENSITY DISKS

.29 ea.

100% Certified 5¼" floppy disks. **Lifetime Warranty**, automatic lint cleaning liner included. 1 Box of 100 $29.00 List $1.99 ea. **SALE $.29 ea.**

COMMWORKS TELECOMMUNICATIONS

SALE $ 59.95 List $100

CommWorks is the easy, complete telecommunication solution for the Apple. Distinguishing features are: file folder user interface, communications files, CommWorks Macros, a powerful on-line text editor, and an auto log facility.(Disk) List $99.95 **SALE $59.95**

1200 BPS MODEM SALE

SALE $119.95 List $199

This 1200 BPS modem contains its own computer for controlling communications and reporting its status back to you. Some features are dial by tone or pulse, fully compatible Hayes function & command, and much more. List $199.95 **SALE $119.95**

300 BPS MODEM SALE

SALE $ 39.95 List $150

Auto dial, auto answer 300 Baud modem. Automates connections and log-on sequences, command menu driven with built in text editor and extensive on-screen help features. List $150.00 **SALE $39.95**

FLIP—N—FILE

SALE $ 14.95 List $24.95

Dust and dirt can hurt your disks. Proper filing and protection of them will reduce wear and tear. Flip-N-File saves and holds over 70 disks. List $24.95 **SALE $14.95**

SOFTWARE

ACCESS
- TRIPLE PACK (D) $19.95

ACCOLADE
- FIGHT NIGHT (D) $18.95
- HARDBALL (D) 18.95
- DAM BUSTERS (D) 18.95
- PSI TRADING CO. (D) 18.95
- LAW OF THE WEST (D) 18.95

ACTIVISION
- HACKER II (D) $22.95
- GREETING CARD MAKER (D) 29.95
- GREAT AMERICAN CROSS COUNTRY RACE (D) 22.95
- LABYRINTH (D) 23.95
- SHANGHAI (D) 23.95

COSMI
- SUPER HUEY (D) $19.95

ARTSCI
- MAGIC MEMORY (D) $39.95
- MAGIC CALC (D) 49.95
- MAGIC WINDOW (D) 49.95

BRODERBUND
- PRINT SHOP (D) $25,95
- PRINT SHOP COMPANION (D) 21.95
- GRAPHICS LIB. 1,2 or 3 (D) 14.95
- KARATEKA (D) 19.95
- BANK STREET WRITER (D) 37.95
- TOY SHOP (D) 39.95
- WHERE IS CARMEN SANDIEGO? (D) 22.95

BLUE CHIP
- MILLIONAIRE (D) $22.95
- BARON (D) 22.95
- TYCOON (D) 22.95
- SQUIRE (D) 22.95

DESIGNWARE
- ALGEBRA (D) $19.95
- CREATURE CREATOR (D) 9.95
- THE BODY TRANSPARENT (D) 23.95
- CRYPTO CUBE (D) 19.95
- EUROPEAN NATIONS & LOCATIONS (D) 23.95
- THE GRAMMAR EXAMINER (D) 23.95
- MATH MAZE (D) 22.95
- MISSION ALGEBRA (D) 23.95
- REMEMBER! (D) 39.95
- SPELLAGRAPH (D) 22.95
- SPELLAKAZAM (D) 17.95
- SPELLICOPTER (D) 22.95
- SPELLING & READING PRIMER (D) 22.95
- STATES & TRAITS (D) 23.95
- TRAP-A-ZOID (D) 22.95

DATA EAST
- KUNG FU MASTER (D) $18.95
- KARATE CHAMP (D) $18.95

ELECTRONIC ARTS
- ONE ON ONE (D) $9.95
- SEVEN CITIES OF GOLD (D) 9.95
- MARBLE MADNESS (D) 24.95
- ARTIC FOX (D) 27.95
- SKYFOX (D) 22.95
- REACH FOR THE STARS (D) 26.95
- FINANCIAL COOKBOOK (D) 27.95
- CHESSMASTER 2000 (D) 27.95
- LORDS OF CONQUEST (D) 27.95
- CARRIERS AT WAR (D) 30.95

EPYX
- DESTROYER (D) $22.95
- BALL BLAZER (D) 14.95
- SUMMER OLYMPIC GAMES (D) 14.95
- CHAMPIONSHIP WRESTLING (D) 23.95
- WORLD KARATE (D) 17.95
- WORLD GAMES (D) 23.95
- SUMMER GAMES II (D) 22.95
- WORLD'S GREATEST BASEBALL (D) 19.95
- WINTER GAMES (D) 22.95
- MOVIE MONSTER GAME (D) 24.95
- GRAPHICS SCRAPBOOK - SPORTS (D) 18.95
- GRAPHICS SCRAPBOOK - OFF THE WALL (D) 18.95
- WORLD'S GREATEST FOOTBALL GAME (D) 22.95

FISHER PRICE
- PETER RABBIT READING (D) $22.95
- 1ST MEN IN MOON MATH (D) 22.95
- JUNGLE BOOK READING (D) 22.95

MINDSCAPE
- LUSCHER PROFILE (D) $22.95
- CROSSWORD MAGIC (D) 27.95
- BOP N' WRESTLE (D) 18.95
- INFILTRATOR (D) 18.95
- JAMES BOND: A VIEW TO A KILL (D) 22.95
- RAMBO: FIRST BLOOD (D) 22.95
- THE AMERICAN CHALLENGE (D) 24.95
- THE PERFECT SCORE (D) 39.95

ABRACADATA
- ARCHITECTURAL DESIGN (D) 39.95
- LANDSCAPE DESIGN (D) 39.95
- INTERIOR DESIGN (D) 39.95

SPECTRUM HOLOBYTE
- WILDERNESS (D) $32.95
- GATO (D) 19.95

SPRING BOARD
- NEWSROOM (D) $29.95
- CLIP ART I (D) 15.95
- CLIP ART II (D) 20.95
- CERTIFICATE MAKER (D) 30.95
- GRAPHICS EXPANDER (D) 21.95

SUB-LOGIC
- FLIGHT SIMULATOR (D) $29.95
- NIGHT MISSION PINBALL (D) 21.95

SPINNAKER
- DELTA DRAWING (D) $12.95
- FACEMAKER (D) 13.95
- KIDS ON KEYS (D) 13.95
- ALPHABET ZOO (D) 16.95
- FRACTION FEVER (D) 12.95
- KINDERCOMP (D) 13.95
- SUM DUCKS (D(..... 19.95
- HOMEWRK HELPER MATH (D) 22.95
- COUNTING PARADE (D) 12.95
- THE MOST AMAZING THING (D) 12.95
- HOMEWORK HELPER MATH (D) 22.95
- HOMFWORK HELPER WRITING (D) 22.95

MEGAHAUS
- MEGAWORKS $59.95
- REPORTWORKS 59.95
- THINKWORKS 59.95

STATEGIC SIMULATIONS INC.
- BATTLE OF ANTIETAM (D) $26.95
- NAM (D) 21.95
- U.S.A.A.F. (D) 30.95
- COLONIAL CONQUEST (D) 21.95
- PANZER GRANADIER (D) 21.95

TELARIUM
- AMAZON (D) $12.95
- DRAGONWORLD (D) 12.95
- FAHRENHEIT 451 (D) 12.95
- RENDEZVOUS WITH RAMA (D) 12.95
- 9 PRINCES IN AMBER (D) 12.95
- PERRY MASON (D) 12.95

WEEKLY READER
- STICKYBEAR MATH (D) 22.95
- STICKYBEAR NUMBERS (D) 22.95
- STICKYBEAR READING (D) 22.95
- STICKYBEAR ABC (D) 22.95
- STICKYBEAR SPELLGRABBER (D) 22.95
- STICKYBEAR PRINTER (D) 22.95
- STICKYBEAR TYPING (D) 22.95
- STICKYBEAR TOWN BUILDER (D) 22.95

INFOCOM
- TRINITY (D) $24.95
- BALLYHOO (D) 24.95
- MOON MIST (D) 24.95
- HITCHHIKERS' GUIDE TO THE UNIVERSE (D) 24.95

BEST SERVICE IN THE U.S.A. • 90 DAY REPLACEMENT WARRANTY • ONE DAY EXPRESS MAIL • 15 DAY FREE TRIAL • OVER 500 PROGRAMS • A CUSTOMER LIST OF OVER 3,000,000 LARGEST IN THE U.S.A.

CALL FOR FREE CATALOG

PHONE ORDERS

8 a.m. - 8 p.m. C.S.T. Weekdays
9 a.m. - 12 noon C.S.T. Saturdays
(312) 382-5050

Add $3.00 for shipping, handling, and insurance. Illinois residents please add 6½% sales tax. Add $6.00 for CANADA, PUERTO RICO, HAWAII, ALASKA, APO-FPO orders. All orders must be in U.S. Dollars. WE DO NOT EXPORT TO OTHER COUNTRIES EXCEPT CANADA. Enclose Cashier Check, Money Order or Personal Check. Allow 14 days for delivery, 2 to 7 days for phone orders, 1 day express mail. Prices & Availability subject to change without notice. Hardware shipping prices vary according to weight. Please call for amount. (No APO-FPO for monitors)

VISA—MASTER CARD—C.O.D. C.O.D. on phone orders only.

COMPUTER DIRECT WARRANTY

All Computer Direct's products carry a minimum 90 day warranty. If anything fails within 90 days from the date of purchase, simply send your product to us via United Parcel Service prepaid. We will IMMEDIATELY send you a replacement at no charge via United Parcel Service prepaid. This warranty proves that ***We Love Our Customers.***

CIRCLE 14 ON READER SERVICE CARD

SAVE SUPER DEALS SAVE

(312) 382-5050 TO ORDER

APPLE COMPATIBLE LASER 128 COMPUTER

SALE $395.00 List $649

Comes complete with 5¼" disk drive built in, 32K ROM, 128K RAM, and much more. Compatilbe with virtually all software for the Apple II, IIe, and IIc. Plus, for a limited time you will receive Magic Window IIe word processor for **FREE**. (a $149.95 Value) List $648.95 **SALE $395.00**

ACCESSORIES SALE

	List	SALE
RS 232 Cable	$29.95	**$14.95**
Centronics Cable	$34.95	**$19.95**
RGB Cable	$24.95	**$19.95**
Expansion Box	$99.00	**$59.95**
2nd Disk Drive	$299.95	**$129.95**

APPLE COMPATIBLE SYSTEM SALE

SALE $519.00 List $1227

Marvelous! Save over $700! Included are: Laser 128 Computer, Big Blue Printer, 12" Samsung Green Monitor, Interface, Magic Window IIe Word Processor, Magiccalc Spreadsheet, Magic Memory Data Base and 2 Paper Rolls. A comparable system costs over $2000. Great savings. List $1227.95 **SALE $519.00**

WICO JOYSTICK SALE

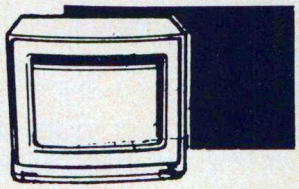
SALE $ 29.95 List $39.95

This analog joystick is terrific. Choose self-centering control or free-floating. For Apple or IBM. List $39.95 **SALE $29.95**

12" 80 COLUMN MONITOR

SALE $99.00 List $249

Super High Resolution amber or green screen monitor. 80 columns x 1000 lines at center. Easy to read non-glare screen. Great for IBM, Apple and Laser Computers. Fantastic. List $249.00 **SALE $99.00**



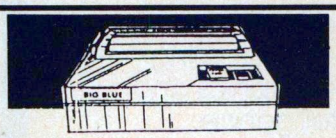
13" COLOR MONITOR

SALE $179.95 List $329

This premium quality monitor comes with speaker and audio hook up, High Resolution, clear screen, 1000 character display, front panel controls and more. (cable $9.95) List $329.00 **SALE $179.95**

BIG BLUE PRINTER

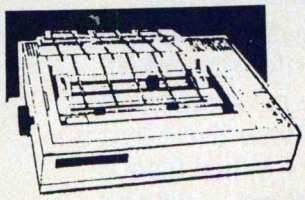
SALE $ 39.95 List $199



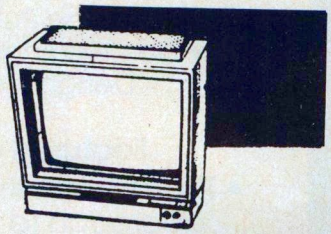
This is the affordable printer you have been waiting for! This 8½" letter size, 80 column dot matrix, heat transfer printer features upper and lower case, underline, graphics, word processing, and much more. List $199.00 **SALE $39.95**

PREMIUM QUALITY 160-180 CPS COMSTAR N.L.Q. 180 PRINTER

SALE $199.00 List $499



This terrific printer has a Near Letter Quality button on the front panel controls. No more turning the printer on and off The high speed dot matrix along with an 8K buffer, which frees up your computer four times faster than conventional printers, allows you to spend more time computing and less printing. Pica, Elite, Italics and Condensed print with super graphics combine to make this a fantastic value. **Lifetime Warranty** on Print Head plus 6 month immediate replacement warranty. List $499.00 **SALE $199.00**



14" RGB & COMPOSITE COLOR MONITOR

SALE $237.00 List $399

Must be used to get 80 columns in color with 80 column computers (C128 - IBM - Apple) (RGB cable $19.95) Add $14.50 shipping. List $399.00 **SALE $237.00**

TV TUNER

SALE $ 79.95 List $130

This tuner has dual UHF/VHF selector switches, mute, automatic fine tuning and computer/TV selector switches. Hook it up between your computer and monitor! Inputs included for 300 ohm, 75 ohm, and UHF. List $129.95 **SALE** $79.95

PRINTER/TYPEWRITER WITH SPELL CHECK

SALE $249.95 List $399

Superb Silver Reed letter quality daisy wheel printer/typewriter. Includes **Spell Check**; over 90.,000 words with capacity to add more of your own. LED readout corrects mistakes before they print. Comes with **free** memory expander. (90 day warranty) Centronics Parallel Interface is built in. (Apple Interfaces Available) List 399.00 **SALE $249.95**

COMSTAR 1000 PRINTER

SALE $189.95 List $349

This is the best values today. Print letters, documents, ect. at 100 characters per second and has Near Letter quality mode. Features are dot addressable graphics, adjustable tractor and friction feed, margin settings, pica, elite, condensed, italics, super & subscript, underline, bold, and double strike. Image writer compatible at half the price. Works with Apple, Laser and Macintosh. List $349.00 **SALE $189.95**

CALL BEFORE YOU ORDER:
• OUR PRICES MAY BE LOWER & AND WE OFFER SPECIAL SYSTEM DEALS •

ATTENTION

COMPUTER CLUBS • DEALERS

We offer big volume discounts!

CALL TODAY

COMPUTER DIRECT

We Love Our Customers

22292 N. Pepper Rd., Barrington, Illinois 60010

(312) 382-5050 to order

CIRCLE 15 ON READER SERVICE CARD

MacA.P.P.L.E.™

Information for your Macintosh needs

A.P.P.L.E. Co-op, who brings you *Call -A.P.P.L.E.* every month, also publishes *MacA.P.P.L.E.* for the knowledgeable Mac user. *MacA.P.P.L.E.* explores a wide variety of Macintosh environments through in-depth and candid coverage. Our user group roots allow us to provide a unique platform for issues and news important to Mac users.

Typical reviews and tutorials include:

• Business Productivity • Personal Finance • Desktop Publishing • Programming • Desktop Engineering • Graphics and Design • Artificial Intelligence

Featured analytical columns:

• **The Macintosh Revue** — a contrapuntal approach to the Macintosh marketplace. • **Mac Science** — how science is changing the Mac and how the Mac is changing science. • **So, What Else is New?** — trends and rumors. • **Silicon Intelligence** — parallels of human and artificial intelligence.

ORDERING *MacA.P.P.L.E.*

Co-op members: For the remainder of your membership period, you can receive *MacA.P.P.L.E.* as an additional publication ***for only $10!*** To take advantage of this offer, call our 24-hr. toll-free order line (see page 9) or use the order form on page 6. **Product Code: FMACAD.** *This offer is good through June, 1987.*

Non-members: A subscription *only* option is available for $21. Use the tear-out card on page 55.

no room for modules compiled and loaded to absolute addresses. These comments do not apply to ProDOS 8 applications.

There are many load module types, but only two noteworthy. The first is S16 ($B3). This file type is a complete ProDOS 16 application. It must be launched by the Launcher, DESKTOP, or APW shell. S16 files may also be launched by any application that has the capabilities of the Launcher, DESKTOP, or APW for launching new applications.

The other is EXE ($B5). This is a shell file, and must be launched by a shell program such as APW. When a shell file is launched, the launching program (the shell, or APW) remains in memory to regain control when the application quits. The shell remains active, and interacts with the shell application. The APW shell may also launch S16 files. In this case, the APW shell invokes the application via the QUIT call, and installs itself on the QUIT stack to regain control when the application QUITs.

The Future

The Apple IIGS is the future of the Apple II world. ProDOS 16 is the base for that future. It is file compatible with ProDOS 8 in that they both use the same filing system. ProDOS 16 is necessary to take advantage of new larger storage devices and the memory of the IIGS. At the present time, all ProDOS 16 features are not implemented and some may change. Therefore, this article simply provides an insight into the future of ProDOS 16. Tools, drivers, and fonts become an everyday part of using the IIGS and ProDOS 16.

By the time you read this, the layout of the disk will probably have changed. As it changes, it also grows. Use of 5.25" drives will slowly disappear for IIGS programs. Even now, the 3.5" diskettes are short on space for complicated applications. And we have only started with the IIGS world.

For more information on APW and APDA:
CIRCLE **80** ON READER SERVICE CARD.

Please rate this article on the Reader Service Card by circling:

81 Excellent **82** Good
83 Fair **84** Poor

TML Pascal Conference

This is a transcription of the conference held on the Apple II Programmer's and Developer's Roundtable (A2PRO), Monday, Febraury 2, 1987. Reprinted from GEnie (General Electric Information Exchange) on-line service with permission of Draco Communications. Contents ©1987, Draco Communications.

This session was moderated by Michael Fischer, SYSOP of the A2 PRO Apple II Developers' RoundTable. For those with a serious interest in programming, A2PRO contains useful information and discussions including Apple Computer's Apple II technotes. Fischer will debut in *Call-A.P.P.L.E.* next month. His latest book is the Apple IIGS Technical Reference available soon through the Co-op.

The conference guest was Tom Leonard (Tom), the author of the acclaimed TML Pascal for the Macintosh. This session focused on the new TML Pascal for the Apple IIGS.

Participants:

Michael	M. FISCHER
Phil	P.H. PETERSON
Tom	PRESS19 (Temporary acct)
Craig	C.KERWIEN
Kent	DRACO (Kent Fillmore)
Jim	MENSCH (Apple Computer)

Michael: Phil, since you were here first, why don't you introduce yourself and ask the first question?

Phil: Michael thanks. How will the interface for IIGS compare to Mac? Will it be easy for developers for both to port code?

Tom: Well there will be a collection of Pascal Units which define the interface to the Apple IIGS ROM as on the Mac. However, the declarations of most routines will vary slightly. But in some cases they are identical. For example, MoveTo, LineTO, etc. (most quickdraw routines) are *exactly* as on the Mac. But when it gets to the menus, etc., the calls are slightly different.

Phil: Is it a modular design like Edit, Link, Pascal, RMAKER, or equivalents?

Tom: Well, there will be two versions of TML Pascal on the GS. The first will run as an APW tool. As such, APW provides the Editor, Linker, Assembler.

Phil: Will I be able to use the shells I've used to trap events?

Tom: Yes, your GetNextEvent loops will be very much the same. In addition, there is something called *TaskMaster* which simplifies most of the details of event loops for"normal" programs.

Phil: Ooohhh, that sounds good!

Tom: Yes, even the constants for event types are spelt the same!

Phil: "Normal" = plain vanilla?

Tom: Yes, of course, there is a Plain vanilla mode. It is much improved from the Mac version. Standard I/O can go to any window (just the current port).

Phil: What's the interface to color?

Tom: Ok, I'll say something quick on color. In "Plain Vanilla" I've set up a set of routines for easily changing colors. When not using the plain vanilla mode, you must access the GSROM. Again, this is done through Pascal units. There are Pascal types for defining color tables and SCBs. And then appropriate calls to ROM are made.

Craig: Standard managers as in the Mac?

Tom: Very much so. They are called Tools though.

Craig: Ahh...

Tom: Quickdraw, Menu, Window, Control, Dialog, Print, List,... Again it is important to remember that the calls are not the same as on the Mac. However, I don't think you'll have to redesign code, just change parameter lists, etc.

Craig: Do you see the Mac version heading towards the GS design (meaning TML)?

Tom: Absolutely. The GS version is the 3rd time I've written the compiler so it keeps getting better. Unit symbol tables are much faster, and an integrated version on the way.

Craig: I notice a significant difference in V.2.02 in speed...

Phil: By "integrated" do you mean like lightspeed?

Craig: What?! Integrated?

Tom: Yes.

Craig: When? When? When? foaming at the mouth, — well, almost.

Tom: Well, we need to wait until the GS version is done (right??)

Craig: GS integrated too?

Tom: I was hoping I'd get a Yes vote on that!

Phil: Tom... Yes!

Tom: Especially from Apple.

Michael: Tom — what exactly do you mean — "integrated"?

Tom: Ok, the first version on the GS will be an APW tool. Soon after that there will be a product which is "integrated". By that I mean that TML Pascal on the GS will be presented in a multi-window, mouse-based editing environment with the ability to "compile a window" and then "link to memory". And, of course, the integrated will be able to link modules developed in APW assembler.

Phil: Will we be able to do DA's on the GS too?

Tom: Yes.

Michael: Both NDA's and CDA's

Tom: There are at, the moment, (v1.0) the compiler will directly support NDA's only.

Craig: Could you describe your GS and Mac development environment? What you do your stuff on?

Tom: For both the Mac and the GS I use TML Pascal. For the GS, though, I use an internal version of TML Pascal which is a Mac to GS cross compiler.

Craig: Ohhh....

Tom: I like my hard disks, tapes, etc.

Phil: Does that mean you wrote a ROM for TML for the GS?

Tom: No, I compile on the Mac, but run on the GS

Craig: What kind of hard disk? GS hard disk?

Tom: I use the Apple HD20SC for the GS.

Craig: Ahh...

Tom: It works well, but I think ProDOS16 still has some problems.

Phil: Tom, you mean slowdos 16? Hee hee.

Tom: Right.

Phil: Anyway, does TML run from ROM?

Tom: I'm not sure what you mean?

Craig: Me neither.

Phil: I got the impression you were running it from ROM, like II BASIC?

Tom: Oh, no. Just as an APW tool.

Phil: Oic, thanks.

Tom: However, it is restartable so that it does not have to be loaded from disk every time it is used to compile.

Phil: You lost me... does that mean battery backed up?

Michael: Tom — tell us about using TML in that way in APW.

Tom: Ok, APW on the GS is much like MPW on the Mac. There is a shell in which "tools" and "utilities" can run within. A tool, such as TML Pascal, must be "installed" by placing its name in the command table and the compiler in the *Languages* directory. Then TML Pascal is given a ""language number". Pascal source files are given the "subtype" of TML Pascal so that when they are compiled, the shell knows to invoke the TML Pascal compiler.

Phil: This sounds like a *Resedit* type thing... just with hardware?

Tom: The compiler produces OMF object code which is then linked with the APW linker to create applications and DAs.

Craig: Will TML Pascal ever go to MPW?

Tom: At the moment there are no plans for it.

Michael: Why not?
Tom: There are two compilers to consider. The Native Mac to Mac compiler and the Cross Mac to GS compiler.

Phil: As a developer, but non-professional (as in Microsoft), I like the more friendly TML.

Craig: Ditto.

Tom: At the moment, I'm heading towards my own integrated environment for the native compiler.

Phil: MPW is over my head and requirements.

Michael: Tom, will the cross compiler be made commercially available?

Tom: Eventually, but at the moment all efforts are to release the native compilers.

Craig: Here's my vote of support.

Tom: I see a need for cross development for large projects. In fact TML Pascal for the GS will always be maintained in a cross development mode.

Michael: Please tell us about the assembly source code output in APW TML.

Tom: Actually, Michael, I'll have to disappoint you. The cross compiler can generate 65816 source, but in the interest of time and speed of the compiler it has to be removed from the APW version for the v1.0 release. If there is a strong interest in it, it can be added later.

Michael: You have one vote of interest here.

Phil: Tom, what's the advantage to the ground floor? Sounds like the best stuff comes in 2.0?

Tom: I'm not sure what you are asking.

Michael: Phil, the ground floor is the only Pascal available for the IIGS.

Tom: I'll add a quick note on code generation. The GS compiler generates code for Sieve which executes in 6.9 seconds!

Phil: Wow!

Tom: That compares to the Mac version at 6.0 seconds. As for prices, both compilers will retail for $125.00, APW and integrated that is. I estimate the APW will ship in 2 weeks with final docs and all. The integrated version will not ship until the latter part of March.

Michael: Tom, a comparison between APW TML and Mac version 2.0.

Tom: The APW GS Pascal and Mac 2.0 are based on the same piece of code. However, the GS compiler has several extensions. The technique for storing Unit symbol files is much, much smaller and much faster now. In addition, language features like MoveLeft, MoveRight, ScanNext, etc., are also supported. There is also a new "style" unit available in addition to the classic style unit. I call them the *Unit Specification* and *Unit Body*, and they work like Modula-2 or Ada does. That is, it splits the interface and implementation parts of a unit into 2 files. There are also special extensions for supporting the GS. There is a new subprogram directive called *TOOL* for defining interfaces to the GS ROMs, and a compiler option for affecting code generation such as LongGlobals+/- so that a large memory model can be supported in the compiler. Also, a DefProc option for creating Definition Procedures(DefProcs) since they require a different calling convention than standard Pascal procedures.and lots more goodies. Also, a compiler option for defining "external" global variables which are defined in another language!

Phil: Well, I'm sold.

Craig: I want one.

Tom: I'm glad of the interest. I look forward to shipping in two weeks!

Phil: I bought TML 1.0 in the begin-ning, and I've used all other Pascal compilers and TML is still my favorite.

Jim(Apple)**:** Me too, I want to convert my monopoly game.

Craig: When do you think an integrated Mac version will be around?

Tom: Integrated Mac version will be late this spring.

Jim(Apple): Tom, can I convert Mac TML source code files with passport?

Tom: Jim — yes, I use Passport all day. Only thing is you will need to remove tabs. It seems that the APW editor doesn't know what a tab is.

Jim(Apple): Convert them to spaces? (I have a visa for that...)

Tom: It just so happens I have an internal (TML Editor to be in integrated version!) that does that.

Phil: Tom, how about a little on the company, that is, do you write most of the code yourself? How about Darryl Lovato of Mac fame?

Tom: Oh yes. Every TML Pascal compiler is entirely of my own doing. Darryl has done another Source Code Library for the GS that will ship with the APW compiler in two weeks and is now working on finishing the integrated environment for the GS compiler.

Phil: That's great. I find his work very helpful.

Tom: Yes, the SCL has been very popular.

Michael: Tell us about Plain Vanilla.

Tom: Plain vanilla is invoked the same way as on the Mac. By merely placing "input-output" in the program heading, the compiler knows to generate the code to initialize all those nasty GS Tools for you and provide you with a 640 mode window which is 20 rows by 80 columns. There is a ConsoleIO unit

ACE COMPUTER CO.

GS-RAM for IIGS	1.5 Mb:	$249
1Mb: $199	512K: $165	256K: $129
RAMWORKS III		
1Mb: $249	512K: $199	256K: $165
RAMFACTOR for IIe/+, Franklin		
1Mb: $289	512K: $239	256K: $189
Z-RAM Ultra II (512K + Clock)		$249
Ultra III (512K + Clock + CP/M)		$299
MultiRAM RGB		
1Mb: $265	512K: $215	256K: $185
MultiRAM CX or CX+ (512K)		$195
5-1/4" 1/2 Ht. Drive (for IIe/c/+)		$139
MODEMS: Mitsuba & OmniTel w/Software		
300/1200B Hayes compatible		$129
2400B with Speaker		$299
PRINTERS		
ImageWriter with IIc Cable		$289
C.ITOH 120 cps w/NLQ		$229
EPSON Daisywheel DX-10		$159
GRAPPLER+ w/16K Buffer		$109
FINGERPRINT G+ IIGS, IIe/+		$ 69
APPLEWORKS 2.0		$199
VIP Professional		$179

*Prices subject to change without notice

VISA and MASTERCARD ACCEPTED

FREE Software with Applied Engineering & MultiRAM Cards

*Call for FREE shipping on selected items (in USA only) and FREE catalog

(602) 821-9393

922 N. Alma School Rd. • Chandler, AZ 85224

CIRCLE 1 ON READER SERVICE CARD

Blankenship BASIC

$39.95 For APPLE II+, IIe, and IIc ProDOS and GS 3.3 versions

MONEY BACK GUARANTEE

either version $25

add $2 P&H ($5 outside U.S.)

ONE COMPATIBLE PACKAGE

1. Real interpreter, not a pre-processor
2. WHILE-ENDWHILE and REPEAT-UNTIL Loops
3. True IF-THEN-ELSE-ENDIF (using WHEN)
4. PRINT.USING, FILE, MERGE, RANDOMIZE
5. PRINT and TAB commands work in HIRES
6. 80 columns supported on IIe and IIc
7. Full editor with AUTO-NUM and RENUM
8. Fast SORT, SEARCH and INSTR$ commands
9. BOX, BOXFILL, DRAW.USING and SOUND
10. Listings are indented automatically
11. DISK command replaces DOS'S CHR$(4)
12. DEFINE and PERFORM named procedures
13. 99% upward compatible with Applesoft
14. All commands entered normally, no &'s
15. 100's of satisfied users world-wide
16. FREE newsletter available to owners
17. Makes your Apple into a NEW machine!!

Mail CHECK to John Blankenship
P.O. BOX 47934 Atlanta GA 30362

CIRCLE 6 ON READER SERVICE CARD

which provides all the standard GotoXy, ClearEOLN, InsertLine, stuff etc., as well as an easy access to 16 colors using dithering. Merely, program "SetColor(i)" where i is in 0..15 for the 16 color. Standard Pascal IO also works to this window or any other window you create.(ie Readln, writeln, etc.) and, a Turtlegraphics unit is available for the plain vanilla window too. For Apple Pascal nuts.

Phil: How about drawstring, char... etc?

Tom: Absolutely, by merely programming "USES QDIntf;" you get all of quickdraw. The plain vanilla window is the current window so things link drawstring, Lineto, framerect, etc., are all available.

Phil: So it's not like {$I QD}? rather an old fashioned uses bloc?

Tom: No, include files are necessary, just USES units.

Jim(Apple)**:** Compatible with Instant Pascal at all?

Tom: Jim, at this point no specific effort has been made to support Instant Pascal. I think we will look into this more with the integrated version of the compiler though.

Jim(Apple): How about Apple Pascal?

Tom: Yes, it is intended that there be a very, very, high degree of compatibility with Apple Pascal.

Jim(Apple)**:** Good.

Tom: You've noticed I've said many times tonight. But, of course, all the Mac stuff like, type casting and bit operations, are available as well.

Jim(Apple)**:** I assume your vanilla plain mode uses quickdraw to display characters?

Michael: And system font?

Tom: Yes it does. That is an issue at the moment though as to whether I should load a monaco font for the window or just use the default.

Jim(Apple)**:** Ah... So not fast enough for a common program? Drat.

Phil: Jim — looks like you're stuck with asm

Jim(Apple): ASM isn't the trouble Phil, its the speed of quickdraw.

Michael: Tom, will TML on the IIGS work in text mode on the text window?

Tom: Yes, but you will have to make calls to the Text Tools routines. At this point, no support for standard Pascal IO to be directed to standard text.

Michael: Are text tool routines a unit in TML?

Tom: Yes, there is a TextTools unit.I'll list the Units: QDIntf, GSIntf, MiscTools, TextTools, Sound, ProDOS16, APW, SANE ConsoleIO and Turtle. The last 2 are *not* GS ROM tools, but TML stuff.

Michael: What about printer output support?

Tom: Ah, yes, glad you asked. In fact, just today I received the first release of the printer tool, so there will be support in v1.0!

Jim(Apple)**:** And it really, really works! Even with the LaserWriter thru AppleTalk.

Tom: Well, I haven't typed in the Pascal unit for it yet and tested it, but we'll see soon enough.

Phil: Jim — congrats to Apple, not mean *feat.*

Jim(Apple)**:** It was a *real mean feet...* In fact, it still is viewed as a miracle.

Jim(Apple): Are you also gonna have a quickdraw additional tools unit?

Tom: Yes, the QuickDraw additional tools will just be added to QDIntf. And, the List Manager will also be supported. I just forgot we got that today too.

Jim(Apple): I am currently working on a network game concept, but was waiting for TML on the GS before porting it..

Phil: Jim — like mazewars?

Jim(Apple): Phil, like mazewars, only gameroom will allow people to add modules. Right now it plays chess and monopoly over the network.

Michael: Tom, what differences in concept between IIGS Source Code Library and Mac SCL?

Tom: The GS SCL and the Mac SCL are in fact very different. The Mac version is quite sophisticated. Lots of definition procedures and the like. The intent of the GS SCL is to have more beginning examples. So we have beginning examples for each of the major toolsets and then a couple of bigger examples that show the tools used together.

Phil: So, is the idea of the GS version less developer-oriented?

Tom: No, the GS SCL is more oriented to someone not familiar with event driven programming or the use of toolsets such as windows, menus, dialogs, etc. Although, they are still *very good* references on how to use the tools.

Phil: Now I find it hard to work any other way, though I occasionally have to.

Tom: I actually use them all the time.

Michael: Thanks Tom, I will be in touch soon about setting up a formal TML section here in A2Pro.

Tom: I'll be getting my own GEnie account so we can stay in touch. Yes, Michael, I'd like to see that.

Michael: I guess I'll call the conference to an official close.

Phil: Good nite all. Thanks for setting this up Michael.

The Co-op maintains its product catalog on Category 7 of the American Apple RoundTable (AART) Bulletin Board as a service for GEnie users. To view a table of contents, enter the AART BBS, SET 7, then type TOPICS.

Please rate this article on the Reader Service Card by circling:

91 Excellent **92** Good
93 Fair **94** Poor

Memory Expansion in the Apple II

Peter & Allen Baum

Why Memory Expansion?

Users want extra memory for a variety of reasons, such as finishing their work faster. Notice we do not say that the system will run faster, because adding memory to a computer doesn't make the processor any faster. However, adding memory can reduce the number of times a program has to read from a disk drive, which is a very time consuming task. This is analogous to replacing the gas tank in your car with a bigger one. While it doesn't mean that you can drive any faster, it does mean that you'll spend less time stopping for gas.

Additional memory can also be used to increase a program's data space, allowing for larger spreadsheets, more records in a data base, or more words in a word processor. However, this will only happen if a program understands how to take advantage of any extra memory. Most of the popular programs on the market today take advantage of the extra 64K that resides on an Extended 80-column card, which plugs into the IIe auxiliary slot. For example, AppleWorks uses this to expand its desktop from 10K to 55K bytes.

However, very little software on the market takes advantage of any other memory expansion card. Buying a memory expansion card does not guarantee that the software you're currently using will suddenly increase its data space. This is true, even if you buy Apple's Memory Expansion card. In fact, until recently, the major usage of memory expansion beyond 128K has been for AppleWorks. Most software developers in the Apple II world write their software so that it works with the typical hardware configuration. This allows them to sell to as many users as possible. Very rarely does a program require a piece of hardware that a typical consumer doesn't have, unless this hardware can provide a function that is not available in the typical system. For example, there are mouse-based applications on the Apple II, such as the word processors MouseWrite (Roger Wagner Publishing) and MultiScribe 2.0 (StyleWare), which provide a Macintosh-like interface of pull-down menus. These programs were designed to use the mouse because they offer a superior interface which is awkward to use with the keyboard based system. (Both these programs offer keyboard equivalents for most of the commands, however, both companies strongly suggest using a mouse).

While software developers may not require an uncommon peripheral, they may allow their software to take advantage of its unique features. For example, while AppleWorks doesn't require 128K of memory, it will take advantage of a memory expansion card and expand the desktop beyond 10K of memory. But developers will only take advantage of a specific hardware device if they feel that a significant portion of users have bought, or plan on buying, the device. Why should they waste the time to program an extra feature that nobody uses? Since memory expansion cards are not present in a typical system, most programs on the market today do not take advantage of them directly. But this might change soon.

When do developers decide that a device should be supported by their software? In many instances they just wait until enough people have asked whether their software supports a particular device. They monitor the phone calls from users and dealers, while watching the best-seller charts provided by distributors. Most of the time, however, they just wait until Apple announces something. Just by announcing a new peripheral, Apple can legitimize a market or set a standard. This is apparently the case with memory expansion. While Applied Engineering and other manufacturers have been shipping memory expansion hardware for many years, only recently has software taken direct advantage of it.

So now Apple has a memory expansion card and the software gods are

happy...Well, almost happy. When Apple announced their card, the software developer was presented with an interesting dilemma. Apple's card was not compatible with any memory expansion card on the market. This means that if a developer enhanced a program to take advantage of the Apple memory card, it probably wouldn't take advantage of any other manufacturer's cards. But on the other hand, a year after Apple shipped their card, the third party cards have a huge lead over Apple in units sold.

So now there are two major types of memory expansion methods in the Apple IIe , one used by cards which go into the Apple IIe auxiliary slot, such as the RamWorks card from Applied Engineering, and another scheme used by the Apple Memory Expansion card, which plugs into one of the regular slots (1-7). We'll start by analyzing the difference between these two protocols, the auxiliary memory card's and the regular slot card's.

A Description of Terms.

The microprocessor accesses data and programs from memory by referring to the 'location' where the data or program is stored. This is analogous to the way that mail is sent to an address. In fact, in computer terms, the 'location' is called the 'address'. Each address must be unique in the same way that the address to your mail box must be unique, or your phone number must be unique.

The microprocessor in the Apple II (the 6502) can access at most 65,536 (64K) addresses at any one time. This doesn't mean that the processor can only address 64K, but that it can address 64K at any given instant. If the processor wants to read data from outside this 64K address space (64K bank) then it must switch in the appropriate 'bank' of memory before reading the data. This mechanism of switching banks of memory is appropriately called 'bank-switching'.

An everyday use of bank switching is the phone system. If you dial only 7 digits, then you access a phone in the local area code which responds to that number. But if you dial 10 digits, then you'll get another phone in a different area code. For example, information can usually be obtained by dialing the area code followed by 555-1212 (notice that phone numbers in TV and movies always begin with 555). The area code is the mechanism that is used to 'bank-switch'. The two types of memory expansion cards use very different mechanisms for bank-switching memory.

Auxiliary Memory Expansion Protocols

The cards which plug into the auxiliary memory slot take advantage of the design of the extra 64K which can be added to the Apple IIe (Extended 80-column card). Most popular programs today make use of a protocol Apple developed for accessing this extra 64K of memory. The RamWorks card was designed to follow this convention instead of trying to invent a new one in order to make software development as easy as possible. The actual protocol works as follows:

- The memory in the auxiliary cards is broken into multiple 64K banks.
- A special location keeps track of the 64K bank that is being used as the auxiliary bank at any given time.
- Each 64K bank is 'shared' with the memory that resides on the Apple IIe motherboard in the same way that the auxiliary 64K on the Extended 80-column card is shared.
- Auxiliary slot memory expansion cards can be expanded from 64K up to 16 Megabytes and usually contain the capability to drive a digital RGB monitor, such as the discontinued Apple Monitor 100 (but not the new Apple Analog RGB Monitor for the IIGS).

Companies with cards which follow this protocol include Applied Engineering, AST Research, and Checkmate Technology.

Apple Memory Expansion Protocol

Apple decided that the protocol for accessing this extra 64K was already too complicated and set about to design a new technique which they thought would be easier for software developers to use. They developed their own card, called the Apple II Memory Expansion card, which is expandable from 256K to 1 megabyte. Other companies quickly followed with compatible cards, some of which are expandable beyond the limits of Apple's card, including one that supports up to 16 megabytes. These cards work in the regular slots (1-7), not the auxiliary slot, which means that they will also work in the Apple II+. Apple's hardware scheme for addressing the extra memory is significantly different than the method used by the auxiliary slot memory cards. It can be argued that Apple's card also uses bank-switching to access the memory. However, in this case the card is bank-switching only a single byte at a time.

The hardware consists of two sets of registers, an address register for specifying the address of the data and a data register for reading and writing the data. The address register is 3 bytes long, requires 3 I/O locations, and is automatically incremented after each access to the data register. So, in order to read data from a specific location in memory, the 20-bit address must first be stored in the address register and then the program can read data from the data register. The next data location can be read without updating the address register, since it was automatically incremented when the first data byte was read. This technique makes reading blocks of data, stored as consecutive data locations, very efficient.

But Apple 'strongly recommends' that the memory on the card be treated as a block storage device accessed through the Protocol Converter firmware, rather than writing directly to the hardware locations. Apple originally made this point so that in the future they could introduce different hardware configurations while ensuring software compatibility. Sure enough, the IIGS expansion memory hardware configuration is different than the Apple II Memory Expansion card. The only software programs that take advantage of the extra memory in the IIGS are those that use the Protocol Converter. Other programs which write software directly to the hardware locations (such as AppleWorks) don't recognize the extra memory on the IIGS. If a software program follows this recommendation, then it should be compatible with any future incarnations of the Apple II and Apple II peripherals. (Remember, "Apple II Forever".)

Companies with cards which support the regular slot protocol are Apple, Applied Engineering and AST Research (playing both sides of the fence), and Cirtech. RAMDISK

Even though a specific application may not take advantage of either one of these memory expansion cards, it is still possible to utilize the memory. The manufacturers of all the different types of cards provide a utility that allows the extra memory to be treated as a RAM disk. A RAM disk configures the extra memory so that an operating system, such as ProDOS, can use it like a disk drive. Files can be saved and read from

the RAM disk just as with a 5 1/4" floppy drive. For example, in ProDOS, BASIC.SYSTEM automatically configures the extra 64K of memory on the Extended 80-column card as a 60K RAM disk. The extra 4K is used to store part of the program which turns the memory into a RAM disk.

To watch a RAM disk in action, just use a file utility program such as the 'FILER' to copy files onto the ProDOS RAM disk. The name of the volume is /RAM. For example, copy either the 'FILER' or 'BASIC.SYSTEM' into /RAM, then run the program. To run a program on the RAM from BASIC, type "-/RAM/filename". From the FILER, just choose QUIT and type /RAM/filename. Notice how fast the new program leaps onto the screen. Do a simple CATALOG of /RAM and watch the response.

(By the way, be careful using the built-in ProDOS RAM disk (/RAM) on the Extended 80-Column card. Programs which utilize more than 64K, such as AppleWorks will clobber the RAM disk and all data and/or files on the RAM disk will be lost).

RAM disks allow users to speed up file reading and writing. A drawback is that the data in the RAM disk is not stored permanently (with one exception, which we will discuss below). If the computer is turned off, all files and data are lost. A user should be very careful about saving data on a RAM disk; if they lose power (and sometimes if the system crashes) then the data will be wiped out with no possibility of recovery. On the other hand, RAM disks are very useful for storing programs since the program can be restored from the disk it was originally loaded from. Many people use a RAM disk to store their most popular programs, so that they can switch back and forth quickly. This also allows some of the popular desk accessories programs such as Pinpoint and Jeeves to run lightning quick.

Advantages & Disadvantages

An advantage of the regular slot card scheme is that developers can think of the extra memory as a single large contiguous data area, which makes programming a lot easier. Another advantage of Apple's scheme is that it will plug into the Apple IIGS. Since there is no slot in the IIGS that is compatible with the auxiliary slot, the auxiliary slot memory expansion cards have no place to plug in. This is especially important if a user thinks they may upgrade their IIe to a IIGS by trading in their IIe motherboard.

A disadvantage to the regular slot protocol is that a program can't actually execute code from the card, but instead must first transfer it to regular memory, and this takes some time. Another disadvantage is that accessing small chunks of data spread throughout the card is very time consuming, due to the extra overhead of using the Protocol Converter firmware. This makes the auxiliary slot cards more efficient for many programs.

The one exception to the power loss problem noted above is with Applied Engineering's RamFactor card. This card is compatible with Apple's memory expansion protocol, but contains an additional hardware feature. This card contains an option that allows the user to retain the contents of the RAM card, even when the system power is off. This battery back-up option, which can be purchased separately, consists of a separate power supply with a battery. The power supply provides constant, uninterruptable power that protects the contents of RamFactor's memory during momentary and extended power outages.

One of the differences between the two different styles of cards is in the routines they use to configure the extra memory as a RAM disk. In auxiliary memory cards, the configuration procedure for the RAM disk is part of the operating system and is stored in system RAM. When the system reboots and reloads the operating system, the operating system reformats the RAM disk, destroying any data it may contain. Cards that are compatible with Apple's memory expansion card, on the other hand, are not reformatted when the system is rebooted with Open-apple-Reset. This is because the Apple style memory cards store the RAM disk configuration routines in ROM.

This leads to another feature of Applied Engineering's RamFactor card It doesn't use any of the built-in system memory to store RAM disk configuration data, like Apple's card. Apple's Memory Expansion card keeps information which is vital to the structure of RAM disk in system memory. If this information is destroyed, then the entire contents of the RAM disk are lost. The RamFactor card keeps its configuration data internal to the card. This is especially important when a bug in a program causes it to run wild and destroy system memory, which includes the configuration data. While this will clobber Apple's RAM disk, it leaves the RamFactor unaffected.

Conclusion

The hardware and firmware protocols are only one of the criteria to consider when you are determining which card to buy. The deciding factors for most people will be the software features, software compatibility, and price. This is especially true if you use AppleWorks as one of your primary programs. However, if you want a battery back-up for the RAM card, then the Applied Engineering RamFactor is the choice. Otherwise, you should evaluate the cards based on software considerations first, and price second. Generally the third party manufacturer's products are less expensive than Apple's, but a more important consideration should be whether the product fits your software needs.

Please rate this article on the Reader Service Card by circling:

101 Excellent **102** Good
103 Fair **104** Poor

For your Apple][e,][c, or][gs

From the Center of the Silicon Prairie

Developer Disk #1 **Second Edition**

DAS Editor - The Applesoft Editor - full screen scrolling line editor with Search & Replace, 2 edit glossaries, RENUMBER, MERGE, & more..

NORT - Nite Owl Run Time with 'Quick Index' program selector - Organize your disks for easy computing.

Getstring - INPUT Applesoft Strings like word processor. Will add a profesional touch to any program.

Packer - Condense HIRES pictures and 40 / 80 column text displays into small BRUNable files.

Screen Editor - Create, store, & recall fancy text displays easy way to use Mouse Text characters.

Also includes; KILLER, SETDATE, Applesoft / ProDOS tutorial, demonstration programs, and reference card.

Developer Disk #2

The Director - Use Arrow keys to select directories from directory map - great for your Hard Disk.

Gofer - New structured Applesoft enhancement allows you to use GOTO or GOSUB "Routine Name".

Stickit - Easily add machine language routines onto Applesoft programs. Library included.

Window - Add windows to your Applesoft Programs.

File Copy - COPY command to move files & load /RAM/.

PUP - ProDOS Utility Program - Disk ZAP editor, ML editor, disk map, disassembler, and more....

PDA - Alphabetize files in any directory or subdirectory.

No additional licensing fees to use our routines. Only $39.95 / disk, Includes Shipping. - Send your personal check or money order. Use our reader service number for FREE Nite Owl News.

Nite Owl Productions

5734 Lamar
Mission, KS 66202
(913) 362-9898

CIRCLE **10** ON READER SERVICE CARD

Modular Assembly Language Programming Part IV
A Hi-Res Movie

The "Pack-Man" (Bob Bishop)

This month we feature subroutine RWBLOCK, a module that lets us access the 64K auxiliary memory of the Apple II or Apple IIc.

The Apple's 6502 microprocessor can address only 64K bytes of memory. However, by connecting 64K bytes of auxiliary memory in parallel with the main memory, it was possible to create a 128K Apple II. Part of this auxiliary memory was intended to be used for displaying 80-column text, as well as double lo-res and double hi-res graphics. The rest of the memory has been somewhat awkward to access. Consequently, most programmers have avoided using it. Now, subroutine RWBLOCK provides easy access to the entire 64K auxiliary memory.

Subroutine RWBLOCK accesses the auxiliary memory in blocks of 256 Bytes. There are 256 such blocks, each block being identified by its block ID number. These ID numbers range from $00 through $FF. (We can imagine a block ID number as specifying which 256-Byte page of the auxiliary memory is being referenced.)

RWBLOCK's Source Code And Documentation

The source code for subroutine RWBLOCK is shown in Listing 1. The documentation describing how to use the subroutine is included as comment statements at the beginning of the listing. In the past, we have provided the documentation for a module as a separate Table. From now on, we will eliminate this redundancy.

The RWBLOCK module references our two old friends, SAVE0 and UNSAVE0. As you recall, the source listings for SAVE0 and UNSAVE0 were presented in Part I of this series.

Using Subroutine RWBLOCK

Subroutine RWBLOCK has three calling parameters that must be specified. They are:

RWBLOCK-1: the COMMAND. A value of 1 means "read a 256-byte block from the auxiliary memory to the main memory." A value of 2 means "write a 256-byte block from main memory to the auxiliary memory."

RWBLOCK-2: the block ID number. ($00-$FF)

RWBLOCK-4: a 2-byte pointer to the 256-byte I/O buffer (The default value is $9600.)

And, as you would expect, subroutine RWBLOCK returns with all of its calling parameters, as well as the X and Y index registers, intact.

Using The Auxiliary Memory

Subroutine RWBLOCK treats the auxiliary memory as a 64K mass storage device. As such, it provides access only in chunks of 256 bytes. You cannot use subroutine RWBLOCK to access just one or two bytes at a time without getting the whole block. In this sense, the auxiliary memory can be thought of as being a block-structured device, such as a floppy disk. In fact, we'll soon see how it can actually be used as a RAM Disk.

A hi-res image requires 8K of memory. Therefore we can fit exactly eight hi-res images in a 64K bank of memory. The

fact that these images can be quickly loaded back into the hi-res display buffers ($2000-$3FFF, and $4000-$5FFF of main memory) suggests trying to create an eight frame animation. The next section explores this idea further.

When using subroutine RWBLOCK, it is important to keep in mind that part the auxiliary memory is also used for displaying 80-column text, as well as double hi-res and double lo-res graphics. If your application uses any of these features, you should be careful how you select your block ID numbers. Otherwise, you will find subroutine RWBLOCK clobbering your display, or vice versa.

Example 1: A Zoetrope Movie

As an example of one application of the RWBLOCK module, consider the ZOETROPE program shown in Listing 2. A Zoetrope was a 19th century toy (sometimes called the "wheel of life") in which drawings of clowns, jugglers or animals were brought to life when viewed through the slits of a rotating cylinder. Our ZOETROPE program uses hi-res page flipping, rather than slits, to produce its animation. But the general idea of cyclic motion is the same. (The program assumes that eight hi-res images have already been loaded into the 64K auxiliary memory. Shortly, we'll see how we can use subroutine RWBLOCK to do this.)

The ZOETROPE program brings the first hi-res image into the primary hi-res page and activates the primary screen. While that image is being viewed, the second image is loaded into the secondary hi-res page. It then switches to this new image while it loads the third hi-res picture into the primary hi-res page, and so on. After the eighth picture has been loaded, the whole process restarts again with the first picture. Therefore, you must be careful to design your eight hi-res images so that the last image cycles back smoothly into the first image.

Now, let's create a little Zoetrope movie. If you are artistically inclined and have a graphics tablet for drawing pictures, you might choose to simply draw your eight hi-res graphics images by hand. Or you might prefer to create your images with a BASIC program, such as the one shown in Listing 3. The program in Listing 3 generates eight surface plots and saves them to disk as files named: FRAME 1, FRAME 2, . FRAME 8. But have patience... The program takes over an hour to run! (Don't forget to put a diskette in your disk drive to hold the eight images.)

Now that we have eight hi-res images (either drawn by hand or generated by a program), we are ready to load them into the 64K auxiliary memory. This is easily accomplished with the little BASIC program shown in Listing 4. (This program assumes that the ZOETROPE module of Listing 2 has already been loaded and linked to the RWBLOCK subroutine of Listing 1, with the ZOETROPE program starting at $1000 and RWBLOCK starting at $1047.) After the last picture has been stored away in the auxiliary memory, the movie begins.

Subroutine RWBLOCK vs. Subroutine RWTS

Those readers who are familiar with the "inner workings" of DOS 3.3 may have recognized a parallel between our RW BLOCK subroutine and DOS's RWTS subroutine. Both subroutines deal with the problem of moving blocks of data between memory and a storage unit. Both have a calling parameter that specifies whether the operation is to be a read or a write, and both require a 2-byte pointer to a user-supplied I/O buffer. Similarly, RWTS has parameters (slot, drive, volume, track, and sector) which collectively specify the equivalent of a block ID.

However, the similarity between the two subroutines is only superficial. In fact, RWTS provides us with an excellent example of how *not* to design a subroutine! I am not trying to be harsh on whoever programmed RWTS. But this series of articles deals with the concept of modular design of assembly language code. It is therefore appropriate that we briefly examine some of the design flaws of RWTS with the hope that we will all benefit from past mistakes. (It will also provide a response to any critics of this series who might be thinking that modular design of assembly language programs is "obvious", "nothing new", and that "everybody already knows how to write code that way!")

First of all, RWTS uses the Y index register as one of its input parameters. (A subroutine should avoid confiscating the index registers.) Furthermore, it requires the user to specify an inordinate number of calling parameters, many of which could have been assigned default values. Two of the parameters even require the USER to specify the previous slot and drive number that RWTS accessed! (This information should have been maintained inside the subroutine.) Finally, upon returning from the subroutine, the user must store $00 in memory location $0048 because the subroutine used that location but "forgot" to restore its former contents. (A subroutine should avoid confiscating absolute memory locations, especially on page zero.) To make matters even worse, none of the Apple-supplied documentation (such as the "DOS Programmer's Manual") even points out this zero-page usage!

infoCache

Now ... an easy to use database for the **Apple II** with the power ... speed ... features ... to meet *your* needs:

- *custom reports*
- *personalized letters*
- *mailing labels*
- *specialized forms*
- *file management*
- *ultra fast* **sorting**
- *single format* **data entry**
- *automatic* **index**
- *file* **merge**
- *import - export* **utilities**

Manage ... your data faster, with less effort than you thought possible!

Design ... your files in any way *you* wish, to meet *your* needs!

see your dealer or call the

.MENU®
THE INTERNATIONAL DATABASE
1-800-THE-MENU

handcrafted software from **macroSolutions, inc.**
P. O. Box 2136
Boise, Idaho 83702

CIRCLE **8** ON READER SERVICE CARD

In spite of RWTS's faulty design, its functional similarity to RWBLOCK suggests the possibility of using the 64K auxiliary memory as a RAM disk. By patching into RWTS, we could intercept the commands that direct the flow of data blocks to and from an actual disk. We could then use subroutine RWBLOCK to redirect some of this data to and from the auxiliary memory.

Example 2: Using The Auxiliary Memory As A RAM Disk

Listing 5 is a patch that lets the 64K auxiliary memory be used as a DOS 3.3 RAM disk in slot 3. *(Note: This patch is not intended for use with an 80-column display.)*

Link and load the RAM disk patch into memory starting at $93C0. Then enter the monitor by typing:

```
CALL-151
```

and issue a:

```
93C0G
```

command. This will install the RAM disk in slot 3. You can initialize the RAM disk by typing:

```
INIT HELLO,S3
```

At this point, you can issue any of the DOS 3.3 commands (SAVE, LOAD, CATALOG, etc.) that you would give to an actual disk.

Be aware that the RAM disk only has about half the capacity of an actual floppy disk. Also, remember that the RAM disk patch resides between $93C0 and $9600, so any programs that use this area of memory will clobber the patch. But, in spite of these limitations, you may find the RAM disk to be a useful little novelty.

That's enough for this month. Next month, we'll take a look at the Apple IIGS and see how our techniques of modular assembly language programming apply to it. //

Please rate this article on the Reader Service Card by circling:

111 Excellent **112** Good **113** Fair **114** Poor

LISTING 1

```
                        ORG     $1000
                        REL
*
                        ENTRY   RWBLOCK
                        EXTRN   SAVE0
                        EXTRN   UNSAVE0
*
*   READ/WRITE A 256-BYTE BLOCK
*   OF DATA FROM/TO THE 64K AUX
*    MEMORY (APPLE //E & //C)
*
*   CAUTION: IF YOUR PROGRAM IS
*   DOING "DOUBLE STUFF" THIS SUB-
*   ROUTINE MAY PRODUCE CONFLICTS
*
*   (THIS SUBROUTINE WILL NOT WORK
*   IN THE LANGUAGE CARD)
*
*   ENTER WITH:
*         BUFFER:    2-BYTE POINTER
*                    (MUST BE IN THE
*                    RANGE $0200 - $BF00
*                    OF MAIN MAIN MEMORY)
*         BLOCKID:   ($00-$FF)
*         COMMAND:1 = READ
*                    2 = WRITE
*                    ANYTHING ELSE = NOP
*
*   RETURN WITH:
*          X-REG: INTACT
*          Y-REG: INTACT
*          80STORE: INTACT
*          LANG. CARD:   WRITE ENABLED
*
BUFFER                  DW      $9600
BLOCKID                 DS      1
COMMAND                 DS      1
*
RWBLOCK                 LDA     #18
                        JSR     SAVE0
*
*   SAVE THE CURRENT STATE
*   OF THE LANGUAGE CARD
*
                        LDA     $C012
                        PHA
                        LDA     $C011
                        PHA
*
*   IF THE COMMAND IS NEITHER A
*   READ NOR WRITE REQUEST, RETURN
*
                        LDX     #0
                        LDA     COMMAND
                        CMP     #1
                        BEQ     READ
                        CMP     #2
                        BEQ     WRITE
                        JMP     DONE
*
*   COMMAND IS A WRITE REQUEST
*
WRITE                   LDA     BUFFER+0
                        STA     FETCH+1
                        LDA     BUFFER+1
                        STA     FETCH+2
                        STX     STORE+1
                        LDA     BLOCKID
                        STA     STORE+2
                        AND     #$F0
                        CMP     #$C0
                        BNE     NOTWC
                        LDA     BLOCKID
                        AND     #$0F
                        ORA     #$D0
                        STA     STORE+2
                        LDA     $C08B
                        LDA     $C08B
                        JMP     SETRW
NOTWC                   LDA     $C083
                        LDA     $C083
SETRW                   STA     $C005
                        LDY     #0
                        BEQ     CONT
*
*   COMMAND IS A READ REQUEST
*
READ                    LDA     BUFFER+0
```

```
                STA     STORE+1
                LDA     BUFFER+1
                STA     STORE+2
                STX     FETCH+1
                LDA     BLOCKID
                STA     FETCH+2
                AND     #$F0
                CMP     #$C0
                BNE     NOTRC
                LDA     BLOCKID
                AND     #$0F
    ORA         #$D0
    STA         FETCH+2
    LDA         $C08B
    LDA         $C08B
    JMP         SETWR
NOTRC           LDA     $C083
    LDA         $C083
SETWR           STA     $C004
    LDY         #1
*
* COPY THE MOVER CODE TO PAGE
* ZERO IN CASE IT NEEDS TO BE
* RUN THERE (TO AVOID CRASHING
* WHEN RAMRD CHANGES)
*
CONT            LDX     #18
XEROX           LDA     MOVER,X
    STA         $00,X
    DEX
    BPL         XEROX
    INX
*
* TURN OFF 80STORE, BUT
* REMEMBER IT'S STATE
*
    LDA         $C018
    PHA
    STA         $C000
*
* IF THE REQUESTED BLOCK IS IN
* THE RANGE $02-$BF THEN EXECUTE
* THE MOVER CODE ON PAGE ZERO.
* OTHERWISE, SET ALTZP AND
* EXECUTE THE CODE RIGHT HERE.
*
    LDA         BLOCKID
    CMP         #$C0
    BCS         ORDINARY
    CMP         #$02
    BCC         ORDINARY
*
SPECIAL         JMP     $0000
*
ORDINARY        STA     $C009
    LDY         #0
*
* THE INFAMOUS MOVER CODE
*
MOVER           STA     $C002,Y
* (THE NEXT 2 LINES GET MODIFIED)
FETCH           LDA     $FFFF,X
STORE           STA     $FFFF,X
    INX
    BNE         FETCH
    STA         $C002
    JMP         ETC.
*
* CLEAR ALTZP & RAMWRT
*
ETC.            STA     $C008
    STA         $C004
*
* RESTORE 80STORE BACK
* TO ITS PRIOR STATE
*
    PLA
    BPL         DONE
    STA         $C001
*
* WHICH $D000 BANK?
*
DONE            PLA
    BMI         *+4
    LDX         #8
*
* READING ROM OR RAM?
*
    PLA
    BPL         READROM
    INX
    INX
*
* WRITE ENABLE THE LANGUAGE
* CARD, AND RETURN
*
READROM         LDA     $C081,X
    LDA         $C081,X
    JMP         UNSAVE0
*
```

LISTING 2

```
                ORG     $1000
                REL
*
        ZOETROPE PROGRAM

        (REQUIRES 64K AUX MEM)

*
                EXTRN   RWBLOCK
*
HOME            EQU     $FC58
*
                JSR     HOME
                STA     $C051
                STA     $C052
                STA     $C057
                LDA     #$01
                STA     RWBLOCK-1
                LDA     #$00
                STA     RWBLOCK-4
*
MAINLOOP        STA     RWBLOCK-2
SUBLOOP         LDA     #$20
                STA     RWBLOCK-3
                JSR     FETCH
                STA     $C050
                STA     $C054
                JSR     FETCH
                STA     $C055
                LDA     RWBLOCK-2
                BNE     SUBLOOP
                BEQ     MAINLOOP
```

```
36  *
37  FETCH       LDX     #$20
38  LOOP        JSR     RWBLOCK
39              INC     RWBLOCK-2
40              INC     RWBLOCK-3
41              DEX
42              BNE     LOOP
43              RTS
44  *
```

LISTING 3

```
 10  DIM C(279)
 30  ST = 0.5
 40  DPHI = 3.14159265 / 4
 50  FOR F = 1 TO 8
 60  HGR2 : HCOLOR= 3
 70  FOR IND = 0 TO 279
 80  C(IND) = 191
 90  NEXT IND
100  FOR Y =  - 11 TO 11 STEP ST
110  X =  - 11
120  GOSUB 1000: GOSUB 2000
130  HPLOT XX,YY
140  XOLD = XX:YOLD = YY
170  FOR X =  - 11 + ST TO 11 STEP ST
180  GOSUB 1000: GOSUB 2000
190  M = (YY - YOLD) / (XX - XOLD)
200  FOR S = XOLD + 1 TO XX
210  H = M * (S - XOLD) + YOLD
220  IF H > C(S) THEN H = C(S)
230  HPLOT  TO S,H
240  IF H < C(S) THEN C(S) = H
250  NEXT S:XOLD = XX:YOLD = YY
300  NEXT X,Y
400  PRINT  CHR$ (4)"BSAVE FRAME
     "F",A$4000,L$2000"
420  NEXT F: TEXT : END
1000 R =  SQR (X * X + Y * Y)
1010 Z = 10 *  COS (R - F * DPHI) / (R + 2):
     RETURN
2000 XX = 10 * X - 2 * Y + 140
2010 YY =  - 10 * Z - 2 * Y + 96
2020 RETURN
```

LISTING 4

```
 10  D$ = CHR$ (4)
 30  ZOETROPE  = 4096
 40  RWBLOCK = 4096 + 4 * 16 + 7
 50  POKE RWBLOCK - 1,2
100  FOR PIC = 1 TO 8
110  PRINT "LOADING FRAME "PIC
120  PRINT D$"BLOAD FRAME "PIC",A$2000"
150  FOR PAGE = 0 TO 31
160  POKE RWBLOCK - 2,32 * PIC - 1) + PAGE
170  POKE RWBLOCK - 3, PAGE  + 32
180  CALL RWBLOCK
190  NEXT PAGE,PIC
200  CALL ZOETROPE
```

LISTING 5

```
1                   ORG     $93C0
2                   REL
3   *
4
5
6       RAMDISK PATCH FOR DOS 3.3
7
8
9   *
10                  EXTRN   RWBLOCK
11  *
12  *   PATCH INTO DOS
13  *
14                  LDA     PATCH1+0
15                  STA     $BD12
16                  LDA     PATCH1+1
17                  STA     $BD13
18                  LDA     PATCH1+2
19                  STA     $BD14
20                  LDA     PATCH2+0
21                  STA     $A836
22                  LDA     PATCH2+1
23                  STA     $A837
24                  LDA     PATCH2+2
25                  STA     $A838
26                  JSR     SETHIMEM
27                  JMP     $03D3
28  *
29  PATCH1          JMP     MYCODE1
30  PATCH2          JMP     MYCODE2
31  *
32  *   INTERCEPT RWTS REQUESTS
33  *
34  MYCODE1         CMP     #$30
35                  BEQ     WOWIE
36                  TAX
37                  LDY     #$0F
38                  JMP     $BD15
39  *
40  *   REQUEST IS FOR SLOT 3
41  *
42  WOWIE           LDY     #$0C
43                  LDA     ($48),Y
44                  STA     RWBLOCK-1
45                  LDY     #$03
46                  CMP     #4
47                  BNE     CONTINUE
48                  LDA     ($48),Y
49                  STA     VOLUME
50                  BNE     DONE
51                  DEC     VOLUME
52                  DEC     VOLUME
53                  JMP     DONE
54  CONTINUE        LDA     ($48),Y
55                  BEQ     VOLOK
56                  CMP     VOLUME
57                  BNE     VOLERROR
58  VOLOK           INY
59                  SEC
60                  LDA     ($48),Y
61                  SBC     #3
62                  BMI     DRVERROR
63                  CMP     #16
64                  BCS     DRVERROR
65                  ASL     A
66                  ASL     A
```

```
67                      ASL     A
68                      ASL     A
69                      INY
70                      ORA     ($48),Y
71                      STA     RWBLOCK-2
72                      LDY     #$08
73                      LDA     ($48),Y
74                      STA     RWBLOCK-4
75                      STA     NUMTRACK+1
76                      INY
77                      LDA     ($48),Y
78                      STA     RWBLOCK-3
79                      STA     NUMTRACK+2
80  *
81  *   IS THIS THE VTOC?
82  *
83                      LDA     RWBLOCK-2
84                      CMP     #$E0
85                      BNE     NOTVTOC
86  *
87  *   VTOC!           MAKE SURE THAT IT
88  *   INDICATES 19 TRACKS/DISK
89  *
90                      LDY     #$34
91                      LDA     #19
92  *   (THE NEXT LINE GETS MODIFIED)
93  NUMTRACK            STA     $FFFF,Y
94  *
95  NOTVTOC             JSR     RWBLOCK
96  *
97  DONE                CLC
98                      LDA     #$00
99                      BCC     EXIT
100 *
101 VOLERROR            LDA     #$20
102                     BNE     ERROR
103 DRVERROR            LDA     #$40
104 ERROR               SEC
105 *
106 EXIT                LDY     #$0D
107                     STA     ($48),Y
108                     BCS     RETURN
109                     LDA     VOLUME
110                     LDY     #$0E
111                     STA     ($48),Y
112                     INY
113                     LDA     #$30
114                     STA     ($48),Y
115 RETURN              RTS
116 *
117 *   INTERCEPT HIMEM CHANGES
118 *
119 MYCODE2             PLA
120                     PLA
121 SETHIMEM            LDA     #>MYCODE1
122                     PHA
123                     LDA     #<MYCODE1
124                     PHA
125                     LDA     $AAB6
126                     JMP     $A839
127 *
128 VOLUME              DS      1
129 *
```


DIGITAL VISION

ALL NEW

COMPUTEREYES/2™

VIDEO DIGITIZING SYSTEM FOR APPLE II SERIES COMPUTERS

The world's highest-quality, lowest-priced video digitizer has just gotten even better! The new card-based COMPUTEREYES/2™ for Apple II, II+, IIe and compatibles connects to any standard video source to capture real-world images on your Apple's graphics display. Hundreds of applications!

COMPUTEREYES/2™ features include:

- Fast scanning-single 6 second scan for all capture modes
- Automatic and manual control over both brightness and contrast
- Keyboard-controlled video switching to allow previewing the video source on the Apple monitor.
- New, familiar, Appleworks-style menu
- Standard software supports Apple Hi-Res and Double Hi-Res graphics, plus Gray-Scale boards for really superb images!
- Optional COMPUTEREYES/2™ Enhancement Software package available to convert COMPUTEREYES images to Printshop, Printmaster, Newsroom, and other formats; perform image negate, flip, etc
- Also available as complete system including quality video camera

STILL ONLY $129.95

Versions available for:

- Apple II, II+, IIe and IIc
- Commodore 64/128
- Atari 800/800XL/130XE
- IBM PC and compatibles ($249.95—includes additional features)
- Atari ST ($249.95-full color digitizer)

See your dealer or order direct. Mass. residents add 5% sales tax. Mastercard, Visa accepted. To order, or for more information, write or call:

DIGITAL VISION, INC.
66 Eastern Avenue Dedham, MA 02026 (617) 329-5400

CIRCLE 7 ON READER SERVICE CARD

MODEM MGR™ $50.00

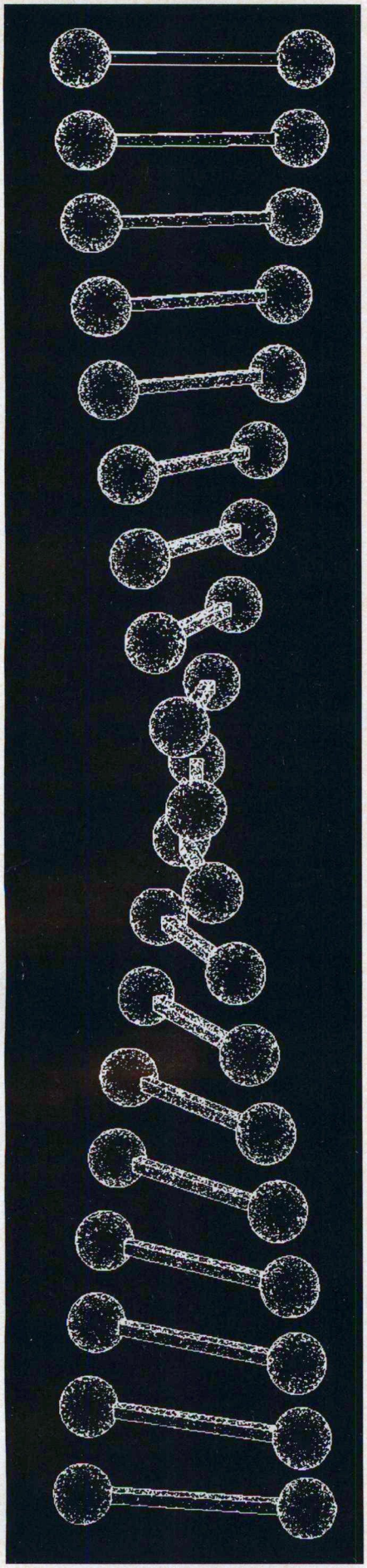
plus $3 ship/hand • plus tax (Calif. only)

- A new modem communications program
- For Apple][+, //c, //e, enhanced //e
- Both DOS 3.3 and ProDOS support
- Supports most serial and modem cards
- Supports most smart and non-smart modems
- Fast operation (110 to 19200 baud)
- Text capture and auto disk-save
- Screen capture (snapshot)
- Full-screen editor
- Full- or split-screen display with block send (for CB, chat, packet radio)
- Macro script files for auto log-on
- Programmable function keys
- XMODEM error-free file transfer
- Supports Apple or Videx 80-column card
- On-screen time-of-day or elapsed-time display (with some clock cards)
- Unattended mode with password protection
- Emulates DEC VT-52, DG 200, others
- Supports most printer cards
- Choice of carrier or "smart" modem control
- Not copy-protected
- Available direct only. Send check to:

MGR SOFTWARE
Suite 101
305 So. State College Blvd.
Anaheim, CA 92806
(714) 993-0294

Apple, ProDOS are trademarks of Apple Computer Inc.

CIRCLE 9 ON READER SERVICE CARD



Silicon Intelligence

Object Logo: A Place Where Words and Numbers Finally Meet

Michael & Lisa Storrie-Lombardi

Last month we looked at some of the general operating characteristics of *Object Logo*. This time around we want to highlight some of its special features that make it stand out from traditional Lisp and Logo implementations.

Arithmetic Operations

For those of us from both the Macintosh and Apple II worlds accustomed to thinking of Logo as a language designed primarily to handle lists of text (Logo's heritage from Lisp), one of the most pleasant surprises comes in Object Logo's arithmetic operation capabilities. Besides implementing the usual integer and floating point subclasses of the class number, they have also provided ratios and imaginary numbers. Instead of focusing solely on manipulating data as lists, they have introduced arrays and matrix structures. Those additions mark a major shift in the target audience for a Logo language. To spend a whole column on "number crunching" in Logo before now would have seemed quite unreasonable. We intend to do just that today. For all of you who hate adding and subtracting and think integration applies only to social phenomena, don't worry. We shall focus on what the symbols and functions of mathematics can tell us about the power of Object Logo. If you use a computer to manipulate any kind of data, keep reading.

Ratios and Error Analysis

Ever since the days when "computer" meant some poor human who spent all day long cranking out tax figures, systematic errors introduced by rounding off ratios during computation have destroyed many a theory or profit margin. The ability of our computers to grind through millions of calculations in a few minutes has markedly increased our interest in what kind of cumulative errors might occur during computation. Now the folks at Coral Software have introduced a numeric class called "ratio" to help untangle things.

If you request that Object Logo handle a ratio in a calculation as a ratio and not divide and round off to a floating point quantity, Object Logo will reduce the ratio to its lowest term and then store it in ratio form. If the ratio divides out to an integer, Object Logo stores it in integer form, not as an integer divided by one. This can provide invaluable assistance in handling certain kinds of round-off errors. Most errors demonstrate what we call error growth stability. For example, look at the following computation performed with and without ratios.

Let's say you strike a deal with your business partner to give him some shares of your software company if he will match every dollar you put into company community donations with a third as much money.

You then start automatically sending a dollar a day to the Seattle Zoo and his bank automatically sends along a third as much. (See Table 1)

And by the year 2000 (a little over 4600 days away) some poor snow leopard does not have an extra $14 plus change.

Two things become apparent immediately: first, this calculation produces a constant cumulative error when

TABLE 1
Round Off Errors at the Zoo

Days	Ratio	Floating Point	Difference
10	$13.33	$13.30	$0.03
100	$133.33	$133.00	$0.33
1000	$1333.33	$1330.00	$3.33

relying on early floating point calculations; second, the discrepancy becomes significant in real dollars as a function of time (or number of contributors). In this case, we would say the algorithm exhibits stable and constant error growth that probably poses little threat to our global calculations, but has a major impact on a single recipient source over time or level of interest in the recipient's welfare. (Most of us also end up wondering just who has that money.)

But what if we started setting up calculations to assess the age of the universe or your end-of-year taxes? The use of power functions, factorials, and recursive algorithms in many engineering and space sciences computations can produce unstable error growth that proceeds in anything but a constant fashion. You would want as little rounding error as possible. In particular, you would not want to let your computations enter what the numerical analysts call exponential error growth. If you run such a risk in your algorithm, the ability to create ratios and then change them to floating point only in the final stages of computation will help you sleep well at night.

Complex Numbers and the World of Fractals

All of you who have expressed so much interest in Mandelbrot's work and our chaos articles (See *MacA.P.P.L.E.* April 1986, March 1987) will instantly appreciate the inclusion of complex numbers. It makes fractal algorithms much easier to visualize. For those of you unfamiliar as yet with fractal geometry, a complex number presents in the form a ± bi where a and b represent real numbers, and i = the square root of -1. Object Logo distinguishes these real and imaginary components of complex numbers. If you wish to add two complex numbers like 2 + 4i and 3 + 5i, you can enter the Listener Window and write

```
? Print |2+4i| + |3+5i|
```

which evaluates to 5+9i. Multiplication of the same pair of complex numbers

```
? Print |2+4i| * |3+5i|
```

leads to **-14+22i.** Recall that i*i= -1, so in standard notation

```
(2+4i) * (3+5i) = (2*3) + (2*5i)
                  + (3*4i) + (4i*5i)
                = 6 + 10i + 12i
                  + 20*(-1)
                = 6 + 22i -20
                = -14 + 22i
```

If the imaginary part of the complex number evaluates to zero, Object Logo will store the whole number as a non-complex number. If you mix arithmetic subtypes in your calculations, Object Logo will "coerce" a simpler subtype into the higher format. The rank order for complexity goes integer < ratio < floating point < complex. For example,

```
? print 4 + 4/3
16/3
? print 4 + 4/3 + 1.5
6.8333
? print 4 + 4.3 + 1.5 + |2+3i|
8.8333+3i
```

You can also transform a ratio or floating-point number to integer or change an integer or ratio to floating-point using the logo primitives Integer and Float, respectively.

Arrays and Lists

Classically, one of the central distinctions between languages such as Fortran, BASIC and Forth on one hand versus Lisp and Logo dialects favored by the artificial intelligence community has appeared in data collection and storage. The AI community, with interest in parsing and storing language data, has focused on list manipulation. The sciences more interested in number crunching have used arrays as the major storage and retrieval mechanisms. Let's look at some of the differences between arrays and lists.

In the most general terms, lists provide greater flexibility, while arrays provide faster, more efficient retrieval. First, in using a list, you construct and/or modify the list whenever you need it. Using the primitive Logo command **FPut**, you stick a new element on the front of a list by storing the element in any available piece of memory. Logo might have memory space scattered throughout the computer for any one list. Conversely, when you create an array, you allocate a certain contiguous piece of memory as the location for the future contents of the array. To allocate that chunk of memory, you must specify the size of your array at the start. Obviously, the list structure has the dual advantage of not allocating memory ahead of time and you can keep making the list larger and larger as necessary. Lists have the disadvantage that since memories have gotten stored all over the place, it takes more time to go track down pieces of information. If you need to store and access your data in one large chunk, you can find any one data element much faster in an array.

Arrays do distract á bit from the programmer's primary task of focusing on the content of his program. You need to set up index variables to later identify the array element you wish to retrieve. You can get side-tracked into thinking about the substructure of the array rather than about your particular program. The average list-oriented procedure just handles the first element of a list and then calls itself recursively. Other differences include the fact that when you create a list you must explicitly specify the elements of that list. In creating an array, you need only specify the length of the array and the elements initialize to an empty list.

To create an array in Object Logo you simply "make" the array you want:

```
? Make "Seasoning Array 3
    ;define an array called Seasoning
? ArrayPut :Seasoning 0 "Salt
    ;Put data into specific locations
    ;in the array
? ArrayPut :Seasoning 1
"Pepper
? ArrayPut :Seasoning 2 "Basil
? Print :Seasoning
    ;Ask Logo to show the current
    ;contents of the array
{ARRAY Salt Pepper Basil}
```

Here **ArrayPut** places the items Salt, Pepper, and Basil at locations 0, 1, and 2 respectively. On request, Logo then told you the contents of the array in the form {ARRAY Salt Pepper Basil}.

If you simply wanted to find one ele-

ment of the array, use the Logo command **Show ArrayGet,** for example:

```
? Show ArrayGet :Seasoning 2
{Basil}
```

If you read the right medical journals and decide salt does have a skull and crossbones on it, then you can remove one seasoning item from the array and replace it with another by

```
? ArrayPut :Seasoning 0 "Garlic
? Print :Seasoning
{ARRAY Garlic Pepper Basil}
```

Here you simply told Object Logo to find the "0" index in the array called Seasoning and insert the element "Basil" instead of "Salt".

Now arrays can have other arrays as elements, and they can have lists as elements. Object Logo provides the needed routines to manipulate arrays within arrays and create complex matrices to manipulate your data in classic "number crunching style." But the real innovation and enhanced power of the language appears when we look at the ease with which Object Logo can shift back and forth between array and list style.

From Lists to Arrays and Back Again

The dynamic memory storage ability permitting a flexible, adaptable, learning environment ranks as one of the great attractions for list processing languages. Artificially intelligent systems need to remember important items as they come up and not feel bound to limit memory capacity to a preset quantity. On the other hand, when a significantly large list of memory elements needs rapid access and manipulation, the ability to suddenly format that list in an array would greatly increase the search effi-ciency of most algorithms.

As you might expect from the tight interplay between lists and arrays in Object Logo, the folks at Coral Software have come up with several utility procedures to hop you back and forth between lists and arrays. Suppose we want to take our Seasoning array above and turn it into a list. We compile a procedure **ListToArray:**

```
To ListToArray :list [:a Array
     Count :list] [:index 0]
If EmptyP :list [Output :a]
ArrayPut :a :index First :list
OP (ListToArray ButFirst :list
     :a :index+1)
end
```

After we define our Seasoning array as above, we can then ask to see our data in a list:

```
? Show ArrayToList :Seasoning
   ;invokes conversion of the
   ;Seasoning array to a list
[Garlic Pepper Basil]
   ;Logo produces a list of 3 words
```

Noticing that the square brackets of list syntax have now replaced the curly brackets {} of the array structure, we check to see if our data responds to list commands:

```
? Print ButFirst ArrayToList
:Seasoning
     ;asking Logo to print out all the list
     ;except the first member.
     ;Pepper  Basil (Logo output)
```

To take our data in the converse direction we invoke the following routine in Object Logo:

```
To ArrayToList :a [:index 0]
If :index = ArrayCount :a [OP []]
OP Fput ArrayGet :a :index
     (ArrayToList :a :index+1)
End
```

and then ask Logo to take a list we give it and transform it into an array:

```
? Make "Seasoning ListToArray
[Garlic Pepper Basil]
```

We then check to see if Logo has converted to array format by simply asking

```
? Print :Seasoning
{ARRAY Garlic Pepper Basil}
```

and

```
? Show ArrayGet :Seasonings 2
Basil
```

to prove that our list now does not just look like an array but really operates as one.

We anticipate that the easy transition back and forth between the list and array formats will prove a major milestone and potential solution for the unfortunate split between "number efficient" vs. "symbol efficient" languages. Object Logo allows us to utilize each structure as needed while our data flows easily from one framework to the other.

Next month we shall review some simple applications demonstrating array and list management techniques. We shall probably focus on numerical analysis methodology, so between now and then you might wish to peruse the following reference list. Until next time, spread the word to both your science and humanities colleagues that we seem to have found a language that can live in both the worlds of numbers and words.

References:

Encyclopedia of Computer Science and Engineering, 2nd edition, Ralston, A. and Reilly, E. D., pages 1036 - 1048, Van Nostrand Reinhold Company, New York, NY, 1983.

BYTE, Volume 12, Number 1, pages 111-124, January, 1987. "An introduction to relaxation methods." Williams, G.

BYTE, Volume 10, Number 7, July, 1985. "Mathematical recreations: parsing and solving linear equations." Kurosaka, R.

For more information on Object Logo:
CIRCLE **120** ON READER SERVICE CARD

Please rate this article on the Reader Service Card by circling:

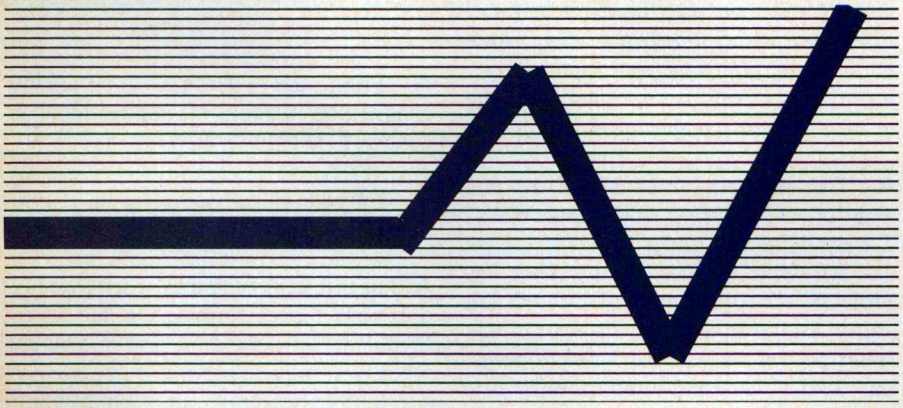
121 Excellent **122** Good
123 Fair **124** Poor

EVENTS CALENDAR

Please send in details of your upcoming conferences,trade shows, meetings, etc., which would have a national or international interest among Apple users. We need your copy at least 2 months in advance. Send your notice to:

Call -A.P.P.L.E.
Events Calendar
290 S.W. 43rd St.
Renton, WA 98055

A.P.P.L.E. Doctor



Bruce F. Field / Robert C. Pratt

Magnetic Interference

I have heard from a few more people regarding interference problems between monitors and the internal disk drive of the IIc when the monitor is placed directly above the IIc. The problem is that interference, probably magnetic, prevents the disk drive from reading diskettes properly. Often some diskettes won't boot in the drive. Moving the monitor a few inches away from the computer will usually solve the problem. But, apparently a small metal shield for the read/write head is missing from some IIc drives. Apple is aware of this and will send dealers extra shields at no cost. More information on this can be found in *Open-Apple* by Tom Weishaar.

This problem is not limited to IIc's, Jack Reed wrote that he had the same problem with a three-year old Amdek 300A and Rana Elite Two disk drives. He says that the sloppy "fix" of putting a layer of aluminum foil between them seems to work but what's discouraging is that the industry doesn't seem to have made any progress in this area in three years.

In response to a number of requests, I include *Open-Apples'* address. *Open-Apple*, P.O. Box 7651, Overland Park, KS. 66207. It is published monthly at $24 for 12 issues.

I also have an unconfirmed report from Tom Vier that the Apple IIGS SCSI card has a stack management problem that causes the f's to crash occasionally and possibly loose data. The present solution is to back your disk up frequently. If anyone has additional information on this subject, please let us know and we'll pass it along.

Telecommunications

Q. *The plot thickens in the great Tandy Model 100/102 question. Last month I bought a Model 102 with plans to upload text files via modem to my Apple IIe. I couldn't believe it when I read the January, 1987 A.P.P.L.E. Doctor and saw that I was not alone in trying to rid myself of those pesky little carriage returns. First, answering the "width?" prompt, as suggested by Chris Arndt, with only a carriage return does not work. I couldn't get it to work so I called Tandy. They say a carriage return defaults to a width of 40. Second, I can't get George Katzenberger's solution to work either. I'm trying the method that uses a modem. If you put the 100/102 into Text mode, then how does one connect via modem to another computer? And if you put the 100/102 in Telcom mode, then after connecting to another computer, there is no way to get the "Save to" prompt.*

A. George's solution was to access the modem from the Text program by pressing F3 to get the 'Save to:' prompt and then typing 'MDM:M7N1E' to send the text out the modem. This simply sends the text you have typed directly out through the modem as if it were a printer. If you need to sign on to your IIe, first use the Telcom program to sign on and set it up to receive an upload. The communication program on your IIe must be capable of receiving and storing a string of text characters without interrupting the transmission or sending prompt characters that require response by the 100/102. Once the IIe is ready to receive text, exit the Telecom program, startup Text, load your text file, and 'save it' to the modem. When finished, you may need to again go to the Telecom program to send a few characters to close the file and sign off the IIe.

AppleSoft

Q. *I attempted to use Microsoft's AppleSoft BASIC Compiler to compile an AppleSoft utility program called CAT SCAN written by Bill Parker which appeared in the* Call -A.P.P.L.E. In Depth Issue, *"All About DOS". CAT SCAN contains a machine language subroutine, RWTS2VAR. The format to call this routine from CAT SCAN is:*

CALL RWTS2VAR : D1$,D2$

The Compiler issues a syntax error when trying to compile this line. Could you suggest a modification to RWTS2VAR that would eliminate the need to specify the parameters D1$ and D2$ in the format listed above?

A. This question has a general application which I'll answer first, and after you wade through all that garbage, then I'll give you the answer you want. There is almost always going to be a problem compiling an AppleSoft program that contains machine language routines. So much so, that unless you understand how AppleSoft works internally, how the Compiler works internally, and exactly what the machine language program does, you are probably doomed to failure.

In this case there are several hidden problems. First, the Compiler won't compile the line because D1$,D2$ is not a valid AppleSoft command. When the RWTS2VAR routine is run from AppleSoft, the routine digests the D1$, D2$ and AppleSoft never sees it, so everything works okay. There is no simple way these variables can be 'POKEd' into the routine.

Second, the purpose of the RWTS2VAR routine is to move bytes from the DOS buffer to an AppleSoft string. There is no guarantee that the Compiler stores strings in exactly the same manner as AppleSoft, so even if RWTS2VAR could be made to function, it may have to be rewritten to work with the Compiler string storage. Also, the routine uses a number of internal AppleSoft routines and pointers to find where the D1$ and D2$ strings are stored, and to move the buffer bytes to the strings. These routines won't work with the Compiler.

Third, there may be a memory conflict. AppleSoft and the Compiler may

use different parts of memory, and putting the machine language routine in a "safe" place protected from AppleSoft does not ensure that the Compiler won't stomp all over it. Since this routine is stored starting at $300, that probably isn't a problem here.

One solution is to forget about using the machine language routine entirely and just perform the same function with BASIC. The reason for the machine language routine in the first place is that AppleSoft is very slow in filling strings, but the Compiler may have acceptable speed. To make this change to CAT SCAN, delete lines 1050 through 1160, change line 1210 to SD2=46267 : D2$=""occasionally, and add the following line.

```
1215  FOR I=1 to 255 :\D2$=D2$
      +CHR$(PEEK(SD2+I))
      :NEXT I
```

This will PEEK the bytes from the DOS buffer and concatenate them into string D2$. The rest of the program is the same.

Use the Version 1.2

Q. *I have a IIGS with a 3.5 drive, a 5 1/4 drive, and just added a UniDisk 3.5. If I boot with RunRun, Copy II+ or AppleWorks 2.0, I cannot get into the UniDisk with Slot/Drive or pathname. If I boot with the IIGS Utility Disk first, then the UniDisk is found at slot 2, drive 1 and can then be used. It takes extra time to use the Utility disk which is not much different from RunRun as a program selector — I'm double dipping as they say. Any suggestions?*

A. The problem most likely is that RunRun, Copy II+, and AppleWorks 2.0 are being run under ProDOS 1.1 (or earlier), while the IIGS Utility Disk has ProDOS 1.2 (or later). ProDOS 1.2 and above support up to 4 drives on the smart port as well as the 5 1/4 floppies, but earlier versions support only two drives and the 5 1/4 floppies. In your case you also have the RamDisk enabled which puts three drives on the smart port. They are assigned this way, dumb Apple drives first (the 3.5 drive to slot 5 drive 1), RamDisk next (to slot 5 drive 2), and finally smart Apple drives (the UniDisk 3.5 to slot 2 drive 1). The 5 1/4 floppies are mapped to slot 6 as usual. The solution is simple, copy the later version of ProDOS from the Utility Disk to your other disks.

Displaying Only Uppercase

Q. *How can I write an Applesoft program that uses upper and lower case for the IIe, IIc and IIGS and will automatically display only upper case on the II+?*

A. ProDOS maintains a machine identification byte at address 49048. The following routine will check this byte and will convert each string to upper case when the program is run on a II+. The program assumes that the ASCII code for a capital letter is 32 less than the corresponding lower case letter. It will place each string on a separate line.

```
 1  GOTO100
10  IF PEEK(49048)>=128 THEN
    PRINT T$:RETURN
20  FOR I=1TO LEN(T$):
    A$=MID$(T$,I,1):IF A$>="a"
    AND A$<="z" THEN PRINT
    CHR$(ASC(A$)-32);:
    GOTO 40
30  PRINT A$;
40  NEXT I: PRINT: RETURN
100 T$="This is a sample
    text.":GOSUB 10
110 REM USE GOSUB 10 instead
    of PRINT T$
120 END
```

One Liners

Q. *I want to use AppleWorks with a Grappler interface card and an MX80 printer. How should I configure AppleWorks to print in 80 columns?*

A. From the interface setup menu, change the default of control-I80N to control-I0N. (That's zero not oh.)

Q. *How can I get AppleWorks to print out category names on my reports?*

A. Put in category names when you layout your report format. On the report layout screen (the first screen you get when you request a print) move the cursor to the beginning or each category name and use the open-apple-V option to include those category names in your report.

Q. *Is a compiler for the C language available for the UCSD p-System?*

A. C is a structured programming language developed at Bell Labs. At present, no C compiler is commercially available under the p-System.

Q. *Is a C compiler available for the Apple II?*

A. Yes, Aztec C is available to run under the 65C02.

Q. *Is the p-System available for the IIGS? Will it support 65816 op codes?*

A. Yes, Pecan Software has a ProDOS 16 hosted p-System that will offer an assembler that will handle 65816 op codes.

Q. *I have purchased UniDOS 3.3 to run DOS 3.3 programs with my UniDisk 3.5. When I run THE Spreadsheet 2.0 under UniDOS I have problems. I know that UniDOS 3.3 uses more memory than DOS 3.3. Could that be causing the problem?*

A. Lee Raesley reports that both programs are trying to use the same segment of memory. Also, THE Spreadsheet patches DOS 3.3. Accordingly, he recommends against using THE Spreadsheet with anything other than true DOS 3.3.

Copies of articles from this publication are now available from the UMI Article Clearinghouse.

Yes! I would like to know more about UMI Article Clearinghouse. I am interested in electronic ordering through the following system(s):

☐ DIALOG/Dialorder ☐ ITT Dialcom
☐ OnTyme ☐ OCLC ILL Subsystem
☐ Other (please specify)_____
☐ I am interested in sending my order by mail.
☐ Please send me your current catalog and user instructions for the system(s) I checked above.

Name_____
Title_____
Institution/Company_____
Department_____
Address_____
City_____State_____Zip_____
Phone (____)_____

UMI Article Clearinghouse

Mail to: University Microfilms International
300 North Zeeb Road, Box 91 Ann Arbor, MI 48106

Please rate this article on the Reader Service Card by circling:
131 Excellent **132** Good
133 Fair **134** Poor

AppleWorld '87

Amidst the magnificent new Macintoshes... is there still room for the Apple II?

Kathryn Hallgrimson Suther

Monday morning greeted us with mild,warm LA weather, and a short wait for the bus to take us to Universal Studios' Amphitheater. We took our seats in the orchestra pit, while John Sculley paused in the aisles, accommodating a photographers' desire to capture the moment.

After all of the 3,500 or so people had settled into their seats, the music that was playing died down, and the first speaker from Apple, Del Yocam, stepped out onto the stage. He was here to welcome us to AppleWorld '87, which marked Apple's first decade in business — "a decade that was exhilarating, frantic, disappointing, frustrating... wonderful."

He thanked all of us in the crowd, the developers, dealers, educators, users, for making Apple what it is today. And, although this occasion would focus around the unveiling of two new Macintosh's, there was a feeling of commitment that began, right here, with the first speaker and continued to build as the days progressed. A commitment to the Apple II as well as the Macintosh computers.

Speaking for the II

Del outlined how the Apple II grew from 4 to 16K, 64 to 128K and finally 256K. How Apple continued, and continues to update and improve on this computer — the memory expansion upgrade for the IIc, the numeric keypad added to the IIe... Apple's "commitment to change."

And then, of course, the best person to augment this feeling of assurance in the future for the II line, Steve Wozniak, appears from behind the curtains and begins to speak.

"People often ask me, when you held the 1st AppleWorld in your garage, did you ever think it would get this big?" Right away, we all settled back for an enjoyable talk by the foremost "personality" of Apple Computer.

Woz recounts why he built his first computer — to alleviate the need to share computers with other engineers at Hewlett Packard, to play games... He really figured the only market for his computer would be with people like himself, ham operators.

But then VisiCalc was developed and all of a sudden, this computer he felt would be of limited appeal, had a whole range of uses he never planned for. This is when he realized something which has remained with him for a long time, and seems to have rubbed off on Apple Computer as a whole.

"If you build a very good, general purpose tool, and that's what a personal computer is, and make it available to lots of people, unimaginable things can happen. Individuals will find ways to use that machine that you never dreamed of."

Doesn't this capture the history and essence of the Apple II?

A New Teacher in the Crowd

Yes, you guessed it. Steve Wozniak announced his new career plans, to a tumultuous round of applause. He now is actively pursuing his elementary education degree. He feels there are still so many ways Apple's can enhance education.

Watching his own children, he has noticed how they have grown closer to their computers. He stated, "Once a computer begins to seem more human, they really develop an attachment to it." He describes them missing their favorite cartoons, being served breakfast at the computer. The more time they spend at the computer, the more he feels they are learning.

The GS, in his opinion, will even broaden this attachment and the prospects of learning. Adding sound and more vivid images increases this human element. "They'll see things and hear things that will help encourage their natural tendencies to learn."

I'm sure we will see the Apple II family continue to influence and mold our education process in the schools.

Let the Fireworks Begin

Preparing us for the inevitable unveiling, we viewed a customer relations' video — showing people of many varied walks of life using Apple computers. As usual, this video was touching, instilling pride in the Apple line of computers.

Finally, Jean-Louis Gassée, with the help of a couple other Apple staff, introduced the two new Macs, the SE and the Mac II. We viewed a demonstration of Cricket Draw (Cricket Software) and got a glimpse of the power and speed these new machines possess.

Upon completion of the initial demonstrations, the Mac II screen began displaying fireworks, exploding to form the words — Mac II. At the same time, "Appalachian Spring" was playing in CD quality. Then, to everyone's surprise, real fireworks lit up the stage. An effective ending to our initial welcome to AppleWorld '87.

After a short press conference with John Sculley, we headed for the Westin Bonaventure Hotel, where we would have lunch and then visit the Product Exhibits and Marketing Environment. There was much more to come in the two days we were to spend in Los Angeles.

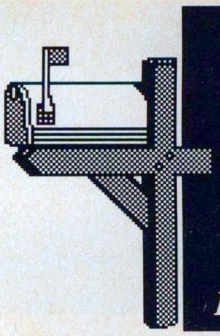
At a later date, we'll take a look at other ways Apple is continuing with their commitment to the Apple II line. And, perhaps we'll hear from some other key people behind the scenes at Apple.

If space allows, we'll try to relay some of the information gained through our seminars, product viewing, and Apple's Marketing Environments in an upcoming issue. For a more in-depth account of the new Macintoshes, seminars relating to these machines and their products, see MacA.P.P.L.E., April 1987.

II

Please rate this article on the Reader Service Card by circling:

141 Excellent **142** Good
143 Fair **144** Poor



Write-A.P.P.L.E.

Readers' Forum

Additional Comments

I have some input for Steven Ohmert and his COPY command for ProDOS. On page 23, the first paragraph leaves the impression that random access text files are the only files that can be sparse. Actually, any ProDOS file type can be sparse. One cannot determine if a file is sparse until the file is actually read. The commands:

```
BSAVE filename,A$2000,L100
BSAVE filename,A$2000,L100,
  B5000
```

will produce a spase binary file.

Ken Kasmarek

Hardware Compatibility

Mr. Apfelstadt, Thank you for your review of new word processing programs in the latest issue of *Call - A.P.P.L.E.* I recently purchased The Bard's Pro-Am as my first word processing program for my Apple IIc. I find it a very fine program with one serious deficiency. On my standard Apple color monitor (model 3A2M4043), the 80 column display is virtually unreadable due to the rainbow effect, and utilizing the "CHANGE CHARACTER SET" option does little to help the situation. I am now using the 40 column display with good results, but cannot really use 40 columns effectively when I have any tables or columns to print because all columns on the right half of the screen scroll to the left.

I have talked with Rick Reh, one of the original Bard programmers, about this problem. He feels that the problem originates from the use of double hi-res software which produces this effect on the standard Apple monitor. Unless I purchase a hi-res monitor for around $600, he feels little can be done. Since I am sure that many other Apple users have similar monitors, I feel that this represents a serious deficiency in this program. I have been advised to turn my monitor into the monochrome mode, but my monitor apparently lacks an accessible switch for this mode. Do you have any suggestions? If I am not able to resolve this difficulty, I will simply have to scrap an otherwise very useful program. I would greatly appreciate any suggestions you may have regarding this problem.

T. Rand Collins, PH.D., M.D.

Thank you for your letter. You brought to light a hardware compatiblility problem that my hi-res monitors didn't catch — the kind of thing Don Lancaster would call a "gotcha". Based on your experience, I would suggest that people with similar equipment wanting to work in 80 columns avoid programs which achieve the effect through double hi-res graphics. This would include Bank Street Writer Plus, HomeWord Plus, and even such things as PinPoints GraphMerge utility. If a review mentions graphic display, beware!

As I see it, you actually have a third option, beyond purchase of a hi-res color monitor or scrapping the program. Monochrome monitors are generally preferred for text applications. Have you considered the purchase of a monochrome Monitor IIc? There are also 'non-Apple' hi-res monochrome monitors advertised through mail-order for as little as $60-$75 in places such as Computer Shopper. You could conceivably outfit your system with a suitable viewing device for less than the cost of a new program, while retaining the color unit for your other uses.

I hope that this helps resolve your dilemma and allow you to enjoy the Bard.

Marc Apfelstadt

Corrections to Copy Command

Copy A ProDOS External Command
(Feb. 87 Call -A.P.P.L.E.) Steven Ohmert

```
Line:
  52  GOSYSTEM  EQU   $BE70          ; MLI call handler
 134            LDA   (PTRO),Y       ;Yep but no reloc.
                                      needed here
 160            CMP   #>COPYEND
 166            ADC   EXTCMD+1       ; Add to new one
 167            BNE   STMSB          ;(always taken) Store
                                      adjusted MSB
 206            LDY   #0
 249  COPYZ     LDA   FBITS
 263  :GETA     LDA   ADDRVAL+1      ;Value passed by
                                      (hibyte)
 341            BCC   :OPNOK
 400            BNE   :MM
 405  :OK2      LDA   PMTFLG         ;Are prompts disabled?
 406            BNE   :OK3
 410  :OK3      LDA   SGINFO+3       ;Get access bits
 422  UNLOCK    LDA   #7
 428  OPNDEST   LDA   BUFSTRT+1
 472            LDA   BUFLEN
 474            LDA   BUFLEN+1
 477            STA   RWLEN+1
 478            LDA   REF1
 479            STA   RWREF
 491  :OK       RTS
 547  :OK       RTS
 694
 728  CPYNAME   STR   'COPY'
```

THE MARKETPLACE

The following items are selected by our editorial staff from the large number of product announcements and news releases sent to us daily. They are presented solely to keep you informed about the current market for Apple related hardware and software. As we have not tested many of these products, appearance here does not necessarily represent endorsement or recommendation by **A.P.P.L.E. Co-op**. Further information about items appearing in **The Marketplace** can be obtained through the Reader Service Card. If you contact any manufacturer directly, please mention that you learned about them in *Call-A.P.P.L.E.*

GRAPHICS FOR THE II

Demco Electronics announces the release of The Graphics Tool Kit, the most complete, most versatile, and easy to use graphics system for the Apple II series of computers. The hardware displays the complete width and half the height of an 8 1/2" by 11" drawing. Since the hardware stores the complete drawing in memory, and allows for automatic scrolling to the second half, a full page of graphics can be dumped to most dot matrix printers. The board allows for any one of eight 640 x 384 screens of hi-res graphics to be instantly displayed. The hardware also has a 100% Apple compatible mouse port built into the board. With all these hardware features, power consumption is kept to a minimum by making maximum use of ultra low power CMOS IC's where possible.

Included in the kit is a graphics design package similar to MacPaint on the Macintosh. Some unique features of the software are:

- Automatic windowing.
- Variable grid lock.
- Draw options accessible from a POP over bar menus.
- Text insertion in for directions.
- Text cursor matches font height and position.
- Proportionally spaced fonts.
- Block functions such as fat bits, move, rotate, flip, duplicate, invert, and cut/paste.
- Inverse data can be displayed to the monitor.
- Work on two 81/2" by 11" pages simultaneously.

The system is configurable for most popular dot matrix printers and interface cards. A Quality Print Mode (160 dots/inch) and full 11" by 14" printouts are supported on printers with these capabilities. The software package also contains fonts and a font maker/editor, vector shapes and a shape maker/editor, many useful basic programs, sample pictures, clip art. In addition to the basic kit the following are also available: Pascal driver, Tektronics 4010 emulation package, over 400 additional fonts, many clip art packages, and video digitizer. List Price: $395.00. Requires: Apple II+, IIe, IIGS conversions or compatibles.

DEMCO Electronics, 10516 Grevillea Ave., Inglewood, CA 90304, (213) 677-0801.

CIRCLE **20** ON READER SERVICE CARD

IIGS SOFTWARE

The Music Studio

Activision announces a special IIGS version of The Music Studio. Its comprehensive music composition tool for home use. The Music Studio is the first program for the new system to hit the market.

The Music Studio provides for both beginners and more sophisticated musicians with the tools necessary to create a wide variety of compositions from elementary tunes to elaborate, fifteen channel, three verse scores. The Music Studio enables a user to capitalize on the unique sound capabilities of the Apple IIGS to:

- Create new musical instruments or use the 45 pre-designed instruments and vocal sound effects.
- Access creativity aids such as a library of compositions and a "music paintbox" for experimenting with notes and instruments.
- Channel the computer, via MIDI interface, to electronic musical keyboards and synthesizers.
- Perform music processing functions, copying, editing, moving, deleting and transposing easily and quickly. Through the built in "music editor", a composition can be tailored to incorporate the desired key, rest, sharps, flats, naturals, measure bars, and more.
- Utilize fully digitized musical instruments for the highest quality sound.
- Compose, add and edit lyrics to compositions.

The IIGS version of The Music Studio supports both the RoomMate powered speaker system from Bose and the Super Sonic Stereo Card from MDIdeas for high fidelity sound. The Software, which comes with a comprehensive manual and separate guide to screen symbols, is easy to use, powerful and flexible. Price: IIGS Version $79.95.

Activision Inc., 2350 Bayshore Parkway, Mountain View, CA 94043, Mailing Address: PO Box 7286, Mountain View, CA 94039, (415) 960-0410.

CIRCLE **21** ON READER SERVICE CARD

SuperSonic Digitizer

MDIdeas announces a new product for the Apple IIGS, the SuperSonic Digitizer. The Supersonic Digitizer enables users to input audio directly into the power Ensoniq sound chip of the Apple IIGS. Users can record, edit, and playback voices, music, and sound waveforms. The SuperSonic Digitizer is an add on board to the MDIdeas SuperSonic stereo card, giving users the functions of an additional card without using additional slot.

The digitizer opens up new possibilities for the Apple IIGS. The uses of the IIGS will increase greatly because people can now input sound into their computer. Combined with the SuperSonic stereo card, the Digitizer provides unprecedented sound capabilities for the IIGS.

The digitizer takes line level audio and inputs it into the ensoniq chip where it is digitized and stored in memory. The unit comes with software which allows editing, recording, and saving audio. The GS in Apple IIGS stands for graphics and sound. Sound is obviously one of the improvements of the new computer. The IIGS can create 15 different voices in its sound synthesizer. The digitizer will be useful to professional musicians as well as everyday end users. The digitizer is useful to programmers and developers as well, it makes life a lot easier for anyone who needs to use sound their applications.

Requirements: The SuperSonic requires and Apple IIGS to run and The Supersonic Digitizer requires a SuperSonic Card to run. Both cards are available directly from MDIdeas and computer hardware dealers. Prices: SuperSonic Digitizer: $39.95 and SuperSonic Card: $59.95

MDIdeas, Inc., 1163 Titon Drive, Foster City, CA 94404 (415) 573-0580.

CIRCLE **22** ON READER SERVICE CARD

COMICS

Accolade Inc., announes Accolade's Comics. The first interactive comic book, featuring two distinct themes and dozens of major and minor story lines incorporating eight arcade-like games, Accolades Comics is the story of a spy named Steve Keene whose mission is to foil evil plots for the Chief of Spystuff, Inc.

Unlike text adventure games, Accolade Comics offers the user the experience of reading a comic book on a computer screen, combining detailed graphics and humorous animation. The player determines the direction of the story by continually selecting from a series of possible answers to questions asked by Keene; some are dead ends, others lead the player into

various themes and story lines. Because the user directs the plot, the story can turn out differently each time the game is played.

The arcade-like games are incorporated to entertain the user and are accessed when Keene falls into traps, "inescapable" position and embarrassing situations. Each of the these games will be scored and recorded for posterity.

Accolade's Comics is comprised of three disks. Accolade Inc, is an independent designer, developer and publisher of entertainment software. Suggested Retail Price:$44.95.

Accolade Inc., 20833 Stevens Creek, Boulevard , Cupertino, CA 95014, (408) 446-5757.

CIRCLE **23** ON READER SERVICE CARD

AN AFFORDABLE ENHANCEMENT

How important is your keyboard? You spend hours at it! Does it feel natural and have useful features? If you've ever used the comfortable, elaborate IBM keyboard, you can tell it was a big factor in that computer's success.

Every new computer since then has had a similar keyboard, even other Apples. Now you can have a low cost, first class alternative to that old fashioned, uncomfortable keyboard on top of your computer! Features include:

- Low profile case, much easier on your wrists and arms.
- 1 keystroke "CATALOG" , "IN#6", etc. command entry: saves time!
- Logical cursor pad layout: reduces mistakes!
- 12 user defined keys for often used commands, names, etc.
- Detached with coil cord: put it where you want!
- II+ gets updated with all ASCII codes, auto repeat, apple keys, cape lock with indicator, easy upgrade for IIe.
- IIe version supports numeric Electronic keypad and IIGS upgrade.
- Good feel with tactile feedback but no annoying clicks.
- Easy plug in installation; style and color matches your computer.

Try it and if you're not completely satisfied, return within 15 days for a complete refund.

Version	II+ Version	IIe
Kit, (not for beginners)	$45.00	$55.00
Assembled	$60.00	$70.00
Conversion kit	$20.00	$20.00

Add $3.00 for UPS & packing & send money order (3 wk. delay if check). *MARTEK, PO Box 24, Novi , MI 48050 (313) 348-98943.*

CIRCLE **24** ON READER SERVICE CARD

SCRABAPPLE

This computer game incorporates crossword puzzle and Scrabble game procedures. The on-screen gameboard is a crossroad puzzle grid (rows & columns). Players form words from their letter selection and attempt to place the word on the gameboard grid, either horizontally or vertically. Letters have

JOIN
A.P.P.L.E. Co-op
World's Largest Computer Co-op

Get more from your personal computer investment!

Benefits of Co-op membership:

- **Become an Owner** - Co-ops are owned by their members, who receive annual dividends that correspond to their annual purchases times the percent of the Co-op's annual profit.
- 12 issues of :
  Call-A.P.P.L.E. magazine
  (Apple II/GS)
  and/or
  Mac A.P.P.L.E. magazine
  (Macintosh)
- **Hotline / Technical Support** : You can get information and help with almost any Apple-related problem from our staff experts. Our staff is backed up by a group of consultants which are specialists in a variety of areas.
- **Telecommunications** - The wave of the future that you can be a part of. With your Apple and a modem you can send and receive information, messages and programs from the A.P.P.L.E. Crate Bulletin Board Service.
- **Co-op Buying** - You will receive discounts (from 20 to 80 percent) on software, hardware, accessories and publications. Many items that members have found to be invaluable, are sold exclusively through the Co-op.
- **Public Domain Software** - Increase your software library for just pennies a program. Thousands of programs available for Apple II and Macintosh computers.
- **And much more.....**

Use one of the tear-out applications on the next page.

JOIN THE CO-OP TODAY !

New Article Rating System

Accompanying each article in this issue are four Reader Service numbers which you can use to rate your enjoyment of that article. Circle the appropriate numbers on the Reader Service Card at right. If you would like more information on products advertised, reviewed, or otherwise mentioned in this issue, please circle their corresponding numbers as well. Drop this card in the mailbox and you will receive the information you requested. Those members who rated the articles as well will be eligible for our monthly drawing at our Co-op meeting. **The winner will receive $100 credit toward any Co-op purchase. The top-scoring author will also receive $100 cash bonus.**

Advertiser Index

Reader Service No.		Page No.
1	ACE Computer Company	35
	A.P.P.L.E. Co-op	32
2,3,4,	Applied Engineering	3,57,60
5	Beagle Bros.	7
6	Blankenship Associates	35
7	Digital Vision	45
8	Macro Solutions	41
	Micro Systems Reaearch	17
9	MGR Software	45
10	Nite Owl Productions	39
11	Precision Data Products	17
12	Preferred Computing	2
13,14,15	Protecto/Computer Direct	29,30,31
	Software Publishers Assn.	59
16	Quality Software	13

For additional products with Reader Service numbers, see The Marketplace and reviews.

READER SERVICE CARD

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150

Please circle one answer for each item below

1. Are you an A.P.P.L.E. Co-op member?
Yes **No**

2. What one computer do you currently use most?
A. Apple II or II+ **D. Apple IIGS**
B. Apple IIe **E. Macintosh**
C. Apple IIc **F. Other** _____

Please indicate with a check mark which of the following is your primary source for hardware and software purchases.

	hardware	software
3. retail outlets	❑	❑
4. mail order services	❑	❑
5. on-line services	❑	❑

CA 4/87 • CARD EXPIRES 5/31/87

Name _____

Address _____

City _____ St _____ Zip _____

❑ *YES, sign me up* as a member of A.P.P.L.E. Co-op

$49 payment enclosed (includes $23 application fee and $26 annual dues)
Indicate which magazine(s) you would like to receive with your membership.
❑ Call-A.P.P.L.E. ❑ Mac A.P.P.L.E. ❑ Both Magazines (I'm adding $15)

❑ **Subscription only, please.** $21 for 12 issues - No Co-op membership
❑ Call-A.P.P.L.E. ❑ Mac A.P.P.L.E. ❑ Both Magazines (I'm adding $15)

❑ Please send me more information about A.P.P.L.E. Co-op.

❑ Please send me information about Institutional Co-op memberships.

❑ Check ❑ Visa ❑ MasterCard

_____ Exp. _____

Name _____

Address _____

City _____ St _____ Zip _____

Foreign postage rates available upon request **CA 4/87**

❑ *YES, sign me up* as a member of A.P.P.L.E. Co-op

$49 payment enclosed (includes $23 application fee and $26 annual dues)
Indicate which magazine(s) you would like to receive with your membership.
❑ Call-A.P.P.L.E. ❑ Mac A.P.P.L.E. ❑ Both Magazines (I'm adding $15)

❑ **Subscription only, please.** $21 for 12 issues - No Co-op membership
❑ Call-A.P.P.L.E. ❑ Mac A.P.P.L.E. ❑ Both Magazines (I'm adding $15)

❑ Please send me more information about A.P.P.L.E. Co-op.

❑ Please send me information about Institutional Co-op memberships.

❑ Check ❑ Visa ❑ MasterCard

_____ Exp. _____

Name _____

Address _____

City _____ St _____ Zip _____

Foreign postage rates available upon request **CA 4/87**

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY CARD
FIRST CLASS PERMIT NO. 217 CLINTON, IA

POSTAGE WILL BE PAID BY ADDRESSEE

Call -A.P.P.L.E.
P.O. Box 1993
Clinton, IA 52735-1993

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY CARD
FIRST CLASS PERMIT NO. 450 RENTON, WA

POSTAGE WILL BE PAID BY ADDRESSEE

A.P.P.L.E. Co-op
290 S.W. 43rd St.
Renton, WA 98055

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY CARD
FIRST CLASS PERMIT NO. 450 RENTON, WA

POSTAGE WILL BE PAID BY ADDRESSEE

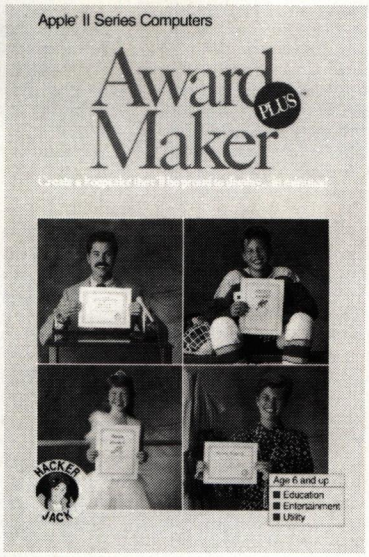
A.P.P.L.E. Co-op
290 S.W. 43rd St.
Renton, WA 98055

values that are added to the players total. An ideal game for classroom or home, children or adults.Price: $19.95.

Inkspot Graphics, 11516 N. Port Washington RD, Mequon, WI 53092.

CIRCLE **25** ON READER SERVICE CARD

AWARD MAKER



Baudville announces the release of Award Maker Plus, complete package for printing professional looking certificates, awards, coupons, licenses, or other documents. The program features intricately designed color or black and white borders.

Award Maker Plus also allows the use of Print Shop graphics for borders, and the ability to import your own hi-res pictures files for the award body.

With Award Maker Plus, just four easy steps make every award special. Select the border. Specify black and white or color. Choose an illustration. Then type in your personalized message and date, and add your signature. It's easy to honor a single person or the whole team!

Award Maker Plus Includes:

- Easy to follow instructions to create awards for any occasion.
- Hundreds of different awards and certificates to pick from for sports, school, home and business; for serious and fun events.
- Several styles of black and white or color borders.
- Sample awards to whet your imagination, and a special price on pin-feed parchment paper to make your next award a standout.
- Free gold embossed press on seals
- Capability to create name files and print out awards for an entire class or group.

Award Maker Plus run on Apple II+, IIe, IIc, IIGS with 64K, and is also available for other machines. Price:$39.95

Baudville, Inc., 001 Medical Park Drive SE, Grand Rapids, MN 49506, (616) 957-3036.

CIRCLE **26** ON READER SERVICE CARD

PASCAL LAB TOOLS

Pascal lab tools is a new two-disk bonanza of formatting teaching aids,' and utilities for Apple Pascal teachers. The package features both teaching tools (lab assignments included) and time saving utilities for Pascal teachers. Source code included. Price: $99.95. ($45.00 Site License available.)

EduSoft has programs for teacher management, mathematics, science, computer literacy, music and early childhood education.

EDUSOFT Inc. CA, AK and HI call (415) 548-2304 or write to EduSoft, PO Box 2560, Berkeley, CA, 94702.

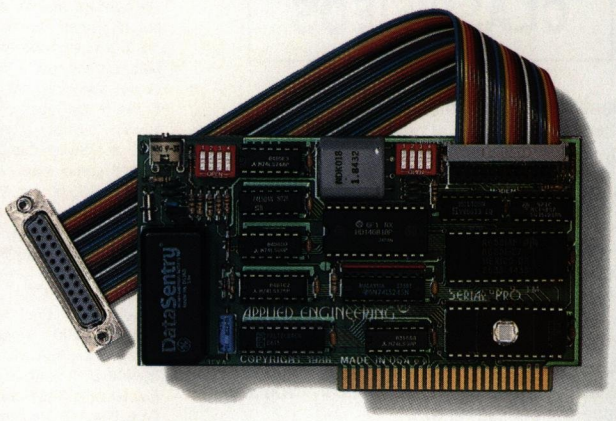
CIRCLE **27** ON READER SERVICE CARD

BLACK BOX CORRECTION

There was an error in the March 87 Marketplace. The correct price for the BLACK BOX NLQ Print Buffer is $269.00. For more information:

CIRCLE **28** ON READER SERVICE CARD

Serial Pro®
The intelligent multifunction card from Applied Engineering.



Serial Pro is a powerful multifunction card for the Apple IIe, II+, IIGS and compatible computers. Serial Pro combines a powerful serial port for interfacing to a printer, modem or other serial device, with a full function clock/calendar. Serial Pro's serial port is compatible with virtually all letter quality and dot matrix printers, including Apple's Imagewriter and Imagewriter II, and can communicate with the fastest external modems at baud rates from 50 to 19,200.

Set up is easy, because unlike other cards, there are no switches to program serial parameters or disks to use. Serial Pro has a built-in setup screen that allows all parameters to be set. And on-screen help that makes it super-easy. An on-board battery stores your selections for over 20 years, but you can change them at any time. Serial Pro is the perfect upgrade for Super Serial card owners looking for more performance or a built-in clock.

Serial Port Features • Fully Super Serial Card compatible but more versatile and easier to use • Compatible with printers • Compatible with modems • Prints graphics to printer (without software) in normal mode, 90° rotation, double size, side by side, and black/white inversion • Variable word length, number of stop bits and parity selection • Crystal controlled circuits are used to provide ultra accurate baud rates.

Clock Calendar Features • ProDos, DOS and AppleWorks compatible. Displays time and date on the AppleWorks screen • Automatically time and date stamps AppleWorks files • 20 year auto recharging nickel-cadmium battery • Realtime interrupts • Built-in on screen time and date settings (no software needed) • Does not use phantom slots.

Serial Pro is perfect for Apple IIe, II+, IIGS or compatible owners in need of a serial port or clock/calendar or both. But unlike other multifunction cards on the market, Serial Pro does not use phantom slots, so all the slots in your computer are useable.

Serial Pro comes complete with manual, cable and instructions for connecting to all the leading printers and modems.

Serial Pro **$159**

Order Today! See your dealer or call Applied Engineering, 9 a.m. to 11 p.m. 7 days. Or send check or money order to Applied Engineering. MasterCard, VISA and C.O.D. welcome. Texas residents add 5⅛% sales tax. Add $10.00 outside U.S.A.

APPLIED ENGINEERING™

The Apple enhancement experts.

(214) 241-6060

P.O. Box 798, Carrollton, TX 75006

CIRCLE **3** ON READER SERVICE CARD

UN CLASSIFIEDS

Members non-commercial rate .05/word
Members commercial rate .25/word
All others: 1.00/word. $25 minimum

Unclassified copy must be received 10 weeks prior to the 1st of the cover date month. For example, ad copy for the December issue should be in our hands by September 20th. A non-commercial rate only applies to single items for sale by a private party, such as a piece of used equipment. Send ad copy with check enclosed to the address below. Specify issue(s) in which to run.

Call -A.P.P.L.E.
Unclassifed Advertisement Dept.
290 SW 43rd St.
Renton, WA 98055

RAMWORKS 1—With 512K including Applied Engineering Desktop Expander & Ramdisk software. $125 w/trade-in of extended 80–column card. No RGB expansion available. (408) 253-9238, Ninth Wave, 21907 Almaden Avenue, Cupertino, CA 95014.

RENT APPLE II SOFTWARE—$5 monthly. No membership fee. Send large $.39 SASE for list. PS Software, 4229 Baker Ave. NW, Seattle WA 98107 .

$2.65 BARD'S TALE MAP/HINT BOOKS—$2.65 postpaid. ASPEN SOFTWARE, 729 E. Portland St., Phoenix, Arizona 85006 (602) 253-0651.

75 CENT APPLE PUBLIC DOMAIN LIBRARY—Our 180 disk library contains thousands of programs for the Apple II, II+, IIe, IIc and IIGS: business, educational, games, EAMON adventures, music, graphics, utilities, hobbyist, more. Our copy-shipping fee is 75 cents/disk postpaid. We can copy onto disk(s) you mail to us for this fee or provide blank disks—$1.10 each extra. We can copy single-sided or double-sided. Our 42 page public domain catalog is $2. No additional charges or membership fees. ASPEN SOFTWARE, 729 1/4 E. Portland St., Phoenix, AZ 85006, (602) 253-0651.

WANTED—For elementary school and high school-Apple computers (II, IIe or IIc). Donations are tax deductible. Call John Henning (206) 941-6786 , Kent.

INTERFACE CARDS FOR WHOLESALE PRICES—16K RAM card $41.80, Z-80 card $39.60, 128K RAM card $71.70, 8088 card $64.10, 80 column card $50.90, Driver card $39.70, Color Graphic card $68.80, Monochrome graphic card $77.40, Mouse $75.30, Telex card $178.00, and 70 more different kinds of cards for special prices. Hunter electronic Co., LTD.P.O. Box 53-130, Taipei Taiwan, Rep. of China.

INTERNATIONAL COMPATIBLES—Supporting II+, Franklin, & all compatible users, with a monthly newsletter, public domain library, on-line services and personal attention. Membership $20 a year. Info: SASE. Franklin-Users-Group-International, 65 East Wind, Tecumseh, MO 65760 Modem (417) 869-5294.

THE LOST ARC OF THE COVENANT—An all-new machine language hi-res adventure game for the Apple II+, IIe, IIc with one drive (3.3 DOS). This adventure has won a gold medal in a Long Island Computer Show, and includes graphics routines from Penguin Software's Graphics Magician. With over 150 hi-res images, you can explore tombs, jungles, subterranean complexes, deserts and other enchanted terrains. This two-diskette adventure has taken over three years to create and can be yours for $14.95, with no postage charge! Send check or M/O to MICROSCAN, 1384 Lyon Place/Dept C, Wantagh, NY 11793. Include $2 if you want hint sheets and a map of this 100 location adventure. Orders will be shipped IMMEDIATELY. Call (516) 826-5807 for more information.

BEYOND PINBALL—The first Pinball Adventure Game—is not another computer simulation of pinball but stretches the concept as only a computer can. Contains not one but 16 games. Contains not one, but 48 screens to play on. Does not have two stationary button-controlled flippers, but instead, a joystick-controlled bumper and 360-degree-swinging bat movable all over the screens. Some of the types of obstacles you'll encounter: Black Holes, Forbidden Zones, Transport Tubes, Moving Objects and Switchable Objects. Includes extensive manual and game maps. All Apple II series. Total price = $21.95 ($35.00 for Pinball and Hi-Res Golf 3). Send check, M.O. or Visa-Mastercard number to Prime-Ware Creations, Box 1058, Philomath, OR 97370. Need more info? Send SASE. (503) 929-6221.

PRINT SHOP USERS CLUB—We help you get the full benefit out of Print Shop! The $30.00 membership fee includes: 1200+ Graphics on 6 disks, plus a public domain utilities disk, plus a copy of the club newsletter, the Update Disk (articles and 100+ more graphics). Send $30.00 or a SASE for graphics list to: Print Shop Users Club, Box 216, Mercer Island, WA 98040.

HI-RES COMPUTER GOLF 3—Eight Pro-Courses version. Now in its sixth year, this version contains the same quality features of prior versions and includes a beginners course and EIGHT professional tour golf courses. Contains true-to-scale fairways and greens (longer holes require multi-screens), green contours, sand traps, roughs, trees, water traps and variable wind conditions. Eight clubs in your golf bag. You physically swing the clubs or use the auto-swing feature. Bad swings may cause tops, undercuts, hooks, slices, etc. Up to a foursome can play. The package contains two diskettes, extensive manual and command card. All Apple II series. Total price = $21.95 ($35.00 for Golf and Beyond Pinball). Send check, M.O. or Visa/Mastercard number to Prime-Ware Creations, Box 1058, Philomath, OR 97370 (503) 929-6221.

CRAKNIQUES—A book that will teach you how to remove copy protection. Crakniques teaches you the methods, the techniques, for removing copy protection. Crakniques also comes with three practice disks and a track examiner. Send $29 check/money order to: M. Haines, 215 N. Terrace, Wichita KS 67208.

TESTMAKER 2.1—for AppleWriter. Automatically compile and print any style test, answer key and questions-used list from one or more of your question files. Automatically renumbers test for multiple versions. Modify and renumber question files. Requires AppleWriter. Cash, check or M.O. for $25.00 to Live Oak Software, P.O. Box 14814, Baton Rouge, LA 70898-4814.

THE WIZZ QUIZZER–Exciting new multiple quiz game with thousands of questions and responses to test your memory or use as a learning device. Keeps score and serenades you. Each quiz NEVER THE SAME the next time. (II+, c, e, gs). Quizzes: MOVIES, SPORTS, CARTOONS, INVENTIONS, ZODIAC, PLANETS, NAMES, FAMOUS INITIALS, etc. Send $8.50 ($8.93 - MD) to GARY HAYMAN, 8255 CANNING TERRACE, GREENBELT, MD 20770, and enjoy!

KERMIT—Why spend hundreds for communications software when the best is FREE? Just send me $8 for the disk, documentation, shipping and handling and I'll send you Columbia University's APPLE-II KERMIT, FREE! Jim Fox, BOX 14756, Pittsburgh, Pennsylvania, 15234.

INTELLIGENT DISASSEMBLER—Learn assembly language by studying programs written by the masters. DISASM converts machine code into clear readable assembler source code. A versatile utility program for experts and novices alike. Creates symbolic text files compatible with S-C, LISA Toolkit & other assemblers. Determine Page Zero usage instantly. Many features. Don Lancaster's ASSEMBLY COOKBOOK says DISASM is "absolutely essential". For Apple II, II+, IIe and Apple IIc STD 3.3 DOS (not copy-protected). Only $30.00 (or $50.00 w/commented source) prepaid. Write for catalog! RAK-WARE, 41 Ralph Road, West Orange, NJ 07052 (201) 325-1885.

DO YOUR TAXES WITH APPLEWORKS—1040Works turns AppleWorks' spreadsheet into a comprehensive tax package that computes Form 1040: prints IRS-accepted Schedules A,B,C,D,E,F,G,SE,W; calculates depreciation, childcare credit, employee expenses, more. Includes a financial organizer, interfaces with Quicken or Dollars and $ense, comes with custom macros for all macro programs. Requires AppleWorks, 128K Apple II or compatible; printer recommended. $23.95. Got IIGS or 256K RAM? 1040Works-X saves steps, computes most returns on one spreadsheet. $26.95. Want macro program? Autoworks, $39.95. From maker of TAXWORKS, rated easiest 1985 tax program by inCider. In NY add stat/local sales tax. PERSONAL FINANCIAL SERVICES, P.O. Box 1401, Dept. V, Melville, NY 11747. (516) 261-8652.

USE DISK II DRIVES WITH APPLE IIGS—DB 19 to 20 pin Disk Drive Converter allows old Disk II drives to be connected to Apple IIGS as slot 6 drives 1 and 2 without a controller card! Send $20.00 check or M.O. (Md. Res. add 5% tax) to: Applied Services, Inc. 7474 Hickory Log Cr. Columbia, Maryland 21045.

MAGAZINE INDEX—an AppleWorks database indexing major articles and reviews for 1986. Cross-referenced by title, author, and subject. Magazines covered include: A+, BYTE, Call -A.P.P.L.E., Incider, InfoWorld, MacNews, MacTutor, MacUser, Nibble, Open-Apple, Personal Computing, II Computing. Two disk sides. Only $8.00 postpaid (money-back guarantee). Kula Software, 2118 Kula Street, Honolulu, HI 96817.

SOFTWARE BUSINESS FOR SALE—Well established firm producing and selling Apple II Software for beer and wine wholesalers. One-man show with lots of potential for growth. Compu/Vin, 3600 Geddes Rd., Ann Arbor, MI 48105. (313) 761-1514.

REAL-TIME HF WEFAX MAPS—on a Dot Matrix Printer. Available for COMMODORE, IBM, APPLE, ATARI and CoCo. See March 86 QST Magazine for circuit details. Kit $28.15 Assembled $39.95 Software—Apple, Atari, & Commodore $10.00. IBM—$15.00 plus $2.50 shipping. For information SASE (large) A & A Engineering 2521 W. La Palma #K, Anaheim, CA 92801 (714) 952-2114.

SCREEN GEN—Develop HI-RES screens for your Apple II on a Macintosh. Use MACPAINT (or any other MAC application) to create the screen. Then use SCREEN GEN to transfer directly from the MAC to the Apple II (with Superserial card) or Apple IIc. Package includes Apple II diskette with transfer software plus fully commented SOURCE code. For entire Apple II family. STD 3.3 DOS (not copy-protected). Only $35.00. Write for catalog! RAK-WARE, 41 Ralph Road, West Orange, NJ 07052, (201) 325-1885.

MIDI HARDWARE/SOFTWARE—Use your Apple to control MIDI equipped music keyboards (like Casio's CZ-101). MIDI-out interface for the Apple IIc is Passport file compatible ($49.00). Hundreds of MIDI song diskettes available from Gershwin to Manilow $19.00). RAM cartridges and new sounds for Casio CZ keyboards. Midi accessories too! Send SASE for catalog. RAK-WARE, 41 Ralph Road, West Orange, NJ 07052, (201) 325-1885

FINALLY—An affordable detached keyboard — IBM style case for comfort, 1 key "CATALOG", PROGRAMMBLE, II+/e. Info/SASE. $45.00 up. Martek, POB 24, Novi, MI 48050

US $8.00 including disk! Thousands of famous Business, Education, games, and programs for the Apple! II/IIe/IIc and IBM/PC details. US $1.00 Reliant. PO Box 33610 Sheungwan Hongkong.

EXTRAWORKS PRINTER UTILITY—Frustrated because AppleWorks won't let you access the full potential of your printer? Get color printing, mousetext, and nice half-height sub and super scripts from your Apple ImageWriter II (and slashed zeroes in AW 2.0), or italics and emphasized double-strike from Epson FX, RX, or MX/graftrax+. Works with above printers on AW 1.2, 1.3, or 2.0 by changing commands, leaving you the custom printer, and allowing the changes to work with proportional type. $20.00 ppd. (NJ residents include 6% tax) to: Eugene Whitehouse, 25 Kensington Avenue, #503, Jersey City, N.J. 07304.

"What's wrong with copying software?"

"I use a lot of programs on my personal computer, and I copy them all the time."

"I'm a programmer. Every time you copy one of my programs, you're taking away my income—I depend on *sold* programs for a living."

"Oh, come on. I bought it: I have a right to copy it."

"You *do* have a right to make a back-up, that's true. But when you start copying programs for your friends and co-workers, that's breaking the law."

"What law? Any copying I do is in the privacy of my own home."

"It doesn't make any difference where you do it. Every time you copy a program without permission from the publisher, you're committing a federal offense."

"That's all right, I won't get caught."

"You're missing the point. The issue isn't "What can i get away with?"—it's "who am I hurting?"

Remember, lots of people worked hard to produce every program you use: designers, programmers, distributors, retailers, not to mention all the people who support users. They have a *right* to be compensated for their efforts, and their major compensation is through software sales."

"Well, I don't mean to hurt all those people—or anyone, really."

"Unfortunately, that's what copying does: it hurts people. And, ultimately, it hurts people like you, who want new and innovative software."

Do you copy software? Think about it.

The unauthorized copying of software is a crime.

SPA Software Publishers Association
Suite 1200
1111 19th Street, N.W.
Washington, D.C. 20036

Created by Halcyon Associates, Brooklyn, New York.

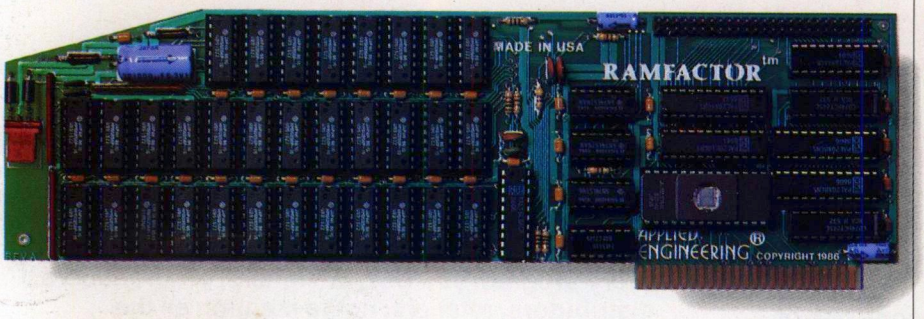
CIRCLE 7 ON READER SERVICE CARD

RamFactor™

The Highest Performance, Speed and Software Compatibility of Any Slot 1-7 Memory Card for the Apple II+, IIe or IIGS.

Now anyone with an Apple II+, Franklin, Laser 128, Apple IIe or IIGS preferring to use slots 1 through 7 can now enjoy the speed and performance that they've been waiting for.

With RamFactor, you'll be able to instantly add another 256K, 512K, or a full 1 MEG on the main board and up to 16 MEG with additional piggyback card. And since virtually all software is automatically compatible with RamFactor, you'll immediately be able to load programs into RamFactor for instantaneous access to information. You'll also be able to store more data for larger word processing documents, bigger data bases, and expanded spreadsheets. And with the battery back-up option you can switch on your Apple and any of your favorite software will be up and running in less than 1 second!



Very Compatible

All the leading software is already compatible with RamFactor. Programs like AppleWorks, Pinpoint, BPI, Managing Your Money, Dollars and Sense, SuperCalc 3A, PFS, MouseWrite, MouseDesk, MouseCalc, Sensible Speller, Applewriter IIe, Business Works, ReportWorks, Catalyst 3.0 and more. And RamFactor is fully ProDos, DOS 3.3, Pascal 1.3 and CP/M compatible. In fact, no other slot 1-7 memory card is more compatible with commercial software.

AppleWorks Power

There are other slot 1-7 cards that give AppleWorks a larger desktop, but that's the end of their story. But RamFactor is the only slot 1-7 card that increases AppleWorks internal memory limits, increasing the maximum number of records in the database and lines permitted in the word processor, and RamFactor is the only standard slot card that will automatically load all of AppleWorks into RAM dramatically increasing speed and eliminating the time required to access the program disk, it will even display the time and date on the AppleWorks screen with any ProDos clock. RamFactor will automatically segment large files so they can be saved on 5¼", 3½", and hard disks. All this performance is available to anyone with an Apple IIe, IIGS *or* II+ with an 80 column card. RamFactor, no other standard slot card comes close to enhancing AppleWorks so much.

True 65C816 16 Bit Power

RamFactor has a built-in 65C816 CPU port for direct connection to our IIe 65C816 card for linearly addressing up to 16 MEG for the most powerful 16 bit applications. (II+ 65C816 card under development.)

Powerful Program Switcher

With RamFactor, you can organize memory into multiple work areas and switch between them. Each work area can contain different programs and even different operating systems. Now you can switch from one program to another or even switch from AppleWorks to DOS 3.3 to CP/M to Pascal to ProDos in under a second. And with our Battery back-up option, you can have permanent storage for up to 20 years.

Quality and Support of the Industry Leader

RamFactor is from Applied Engineering, the largest, most well supported manufacturer of Apple peripherals and the inventor of large RAM cards for the Apple. With our 5 year no hassle warranty and outstanding technical support, you're assured of the most trouble free product you can buy.

Features:

- Up to 16 MEG total memory, 256K to 1 MEG on main board. Up to 16 MEG with additional memory on piggyback card.
- Fully Apple II Memory Expansion compatible
- Compatible with Apple IIe, II+, IIGS, Franklin and Laser 128
- Battery back-up option allows you to turn on your Apple and run your favorite programs in less than 1 second!
- Automatically recognized by ProDos, DOS 3.3, Pascal and standard CP/M
- Built-in RamDrive™ software (a true RAM disk not disk caching)
- Systems are directly bootable from RamFactor if desired
- Built-in linear addressing 16 bit co-processor port
- Built-in self diagnostic software
- Automatic expansion with AppleWorks 1.3 or later
- Allows Apple II+ and IIe to run your AppleWorks without buying additional software
- Accelerates AppleWorks
- Displays time and date on the AppleWorks screen with any ProDos clock
- Fits any I/O slot except slot 3
- Fully socketed and user upgradeable
- Much, much more

RamFactor with 256K	**$239**
RamFactor with 512K	**$289**
RamFactor with 1 MEG	**$389**
RamFactor with 2-16 MEG	**CALL**
Battery Back-up Option	**$179**
65C816 16 Bit Card	**$159**

Order RamFactor today . . . with 15 day money back guarantee and our "no hassle" five year warranty. *See* your dealer *or call* (214) 241-6060, 9 a.m. to 11 p.m., 7 days, *or send* check or money order to Applied Engineering. MasterCard, Visa and C.O.D. welcome. Texas residents add 5⅛% sales tax. Add $10.00 if outside U.S.A.

Applied Engineering™

The Apple enhancement experts.

(214) 241-6060

P.O. Box 798, Carrollton, TX 75006

CIRCLE 4 ON READER SERVICE CARD